

SCIENCE

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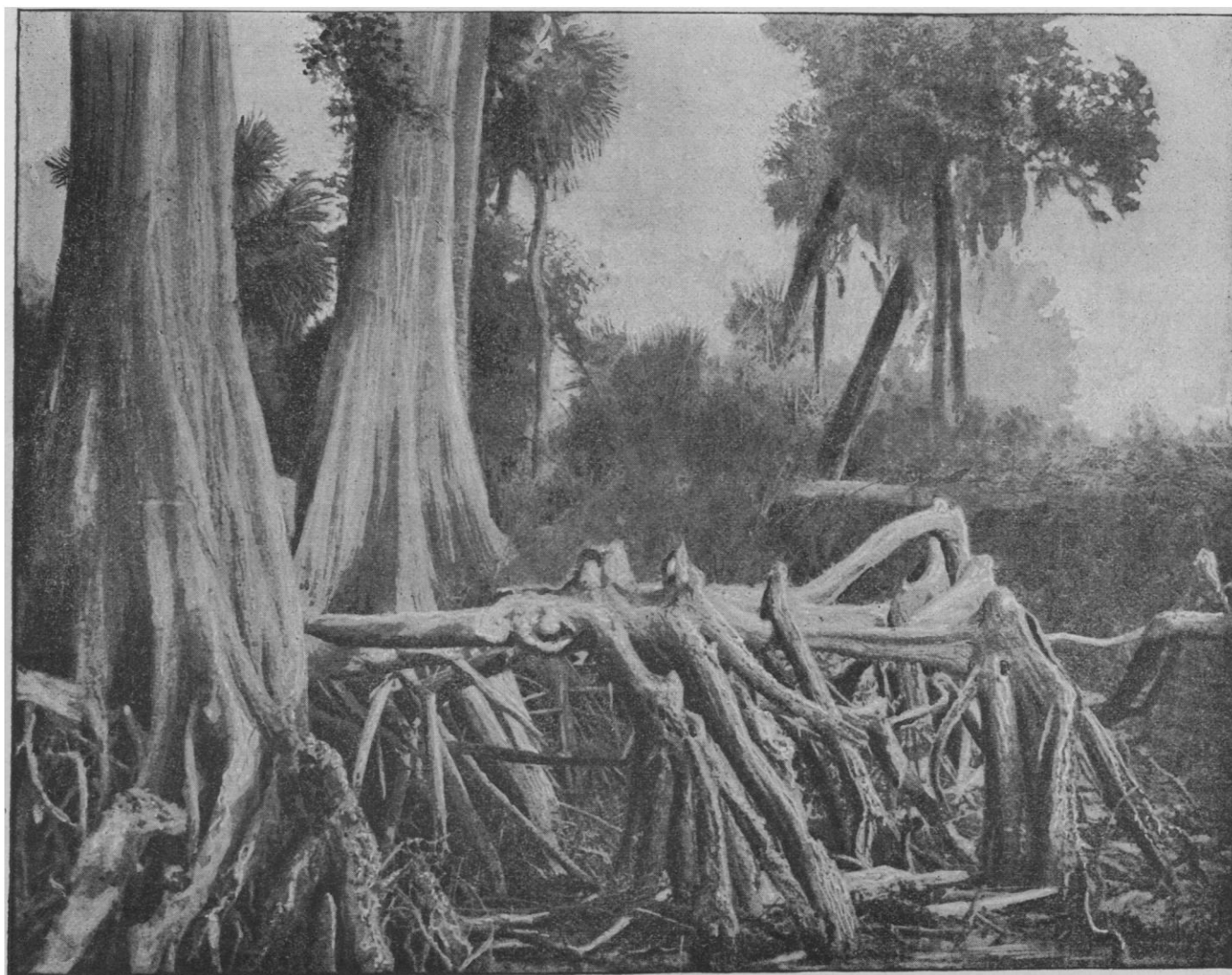
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THE KNEES OF THE BALD CYPRESS: A NEW THEORY OF THEIR FUNCTION.¹

FROM time to time, during and since my first visit to our southern tier of States in 1876, I have examined, sketched, and photographed the roots of the deciduous cypress, the *Taxodium*

what an engineer would pronounce a most dangerous foundation, — loose submerged sand, the saturated morass, or the soft alluvium of low river-margins. But, notwithstanding this seeming insecurity, I have never found a healthy cypress that had fallen before the fierce hurricanes that sweep through the southern forest-lands. It is a pleasure to follow Bartram in his enthusi-



DENUDED ROOTS OF THE BALD CYPRESS, SHOWING KNEES AND UNDERGROUND STRUCTURE.

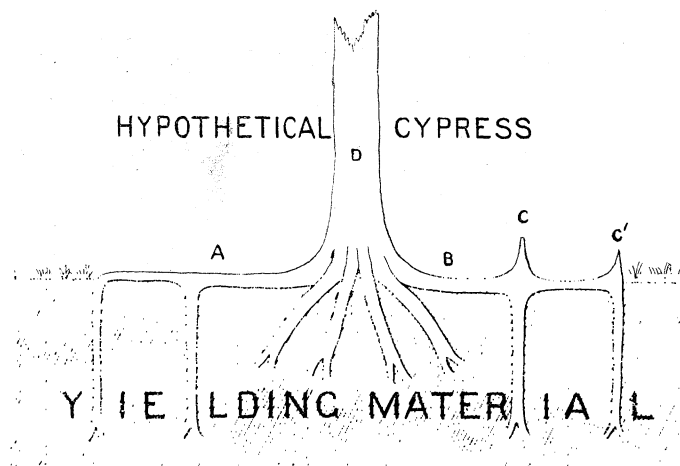
distichum of Richard. I was attracted to the tree because of the singular beauty of its form and foliage, and by the unusual boldness with which it raises its great gray, smooth column, sometimes over a hundred feet, perpendicularly, above and upon

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astic burst of admiration for this tree as he writes of it in east Florida one hundred and sixteen years ago: "This Cypress is in the first order of North American trees. Its majestic stature is surprising. On approaching it we are struck with a kind of awe at beholding the stateliness of its trunk, lifting its cumbrous top toward the skies and casting a wide shade on the ground as a

dark intervening cloud, which from time to time excludes the rays of the sun. The delicacy of its color and the texture of its leaves exceed everything in vegetation. . . . Prodigious buttresses branch from the trunk on every side, each of which terminates underground in a very large, strong, serpentine root, which strikes off and branches every way just under the surface of the earth, and from these roots grow woody cones, called Cypress knees, four, five and six feet high, and from six to eighteen inches and two feet in diameter at the base." Elliot (Botany of South Carolina and Georgia, 1824, p. 643) says, "This cypress resists the violence of our autumnal gales better than any other of our forest-trees." By my friend, Dr. J. S. Newberry, whose extended geological labors have led him to examine many widely separated cypress-bearing regions in the Mississippi valley and elsewhere, I am assured that he remembers no instance of the overthrow by the wind of a living *T. distichum*.

The surprising and characteristic temerity of the tree is accompanied by another striking peculiarity: it almost invariably, in soft soils, throws upward from the upper surface of its roots conspicuous protuberances that are known as "cypress knees." Professor Wilson, who has made a careful and valuable study of the species in the forests of southern Florida, and also by cultivation, writes, regarding the formation of these protuberances, "The small roots, which are six or eight inches below the sur-



face, grow upward, . . . and, upon reaching the surface, turn and go down into the soil;" . . . "at each point where the root comes to the surface, begins later the development, on its upper side, of the so-called 'knees.'" In the organ of the Pennsylvania Forest Association *Forest Leaves* (December, 1889), is an excellent article by Professor Wilson on the *T. distichum*, and a remarkably fine engraving of a tree with enormous knees.

These seemingly abnormal growths have attracted much attention, and for more than half a century have furnished an enigma to the solution of which scientific travellers have addressed themselves. Michaux made a careful study of the cypresses, and in his "Sylva," published in 1819, says, "The roots are charged with protuberances eighteen to twenty-four inches high. [I have ridden among them in central Florida in temporarily dry upland basins, where they arose to my breast as I sat upon the saddle, and were not less than seven feet in height above the root.] These protuberances are always hollow, and smooth on the surface, and are covered with a reddish bark, like the roots, which they resemble in softness of wood. They exhibit no sign of vegetation, and I have never succeeded in obtaining shoots by wounding the surface and covering it with earth. They are peculiar to the cypress, and begin to appear when it is twenty to twenty-five feet high." Michaux adds, with the frankness natural to a scientific mind, "No cause can be assigned for their existence." Hoopes says, in his "Book of Evergreens" (1868), "No apparent function for which the knees are adapted has been ascertained." And Veitch, who seems to have studied the protuberances in England, gives in his "Manual" (1881, p. 216) a

picture of a tree growing at Hlesworth, surrounded by scores of knees, and says, "They are peculiar to this cypress, and no cause has been assigned for their existence." That the question continued in this unilluminated condition until recently, was shown in 1882, when I had the privilege of visiting, in company with the highest botanical authorities, Dr. Gray, Thomas Meehan, John H. Redfield, John Ball, Professor Carruthers, and others, the classic collection of trees planted by William Bartram on the borders of the Schuylkill. There we examined a fine cypress and the knees it had produced. Dr. Gray then told me that the use to the tree of the knees was unknown. I remarked that they might be a means of raising a point on the root above surrounding water, to the end that a leaf-bearing shoot could readily sprout therefrom. To this suggestion he made the same statement made by Michaux and above recorded. Unaware that the subject had been so thoroughly investigated, I have since that period examined hundreds of living "knees" in southern swamps, and found upon them no trace of bud, leaf, or sprout, except where some seed may have lodged in a decayed or depressed portion of the surface, and there taken root.

In 1887 I had the good fortune to find a number of cypress-trees under such unusual conditions that their aforetime subterranean anatomy could be studied without obstruction; and I reached a conclusion respecting the use to the tree of the protuberances, which I have retained in my note-book, awaiting an opportunity to make some further illustrative sketches before placing it before botanists. Some recent publications on the subject, by widely and favorably known authors, have, however, ascribed to the cypress-knees the sole function of aerating the sap of the parent tree, and this idea bids fair to become embedded in botanical literature. Therefore this communication comes to you earlier than I had purposed sending it.

Stretches of the shore of Lake Monroe, in central Florida, are closely set with large cypress-trees. They grow in various kinds of bottom,—clay, mud, and sand. Those of which I shall here speak stood in sand so loose that, when the level of the water was lowered, the waves readily washed it away, and carried it into the depths of the lake. Some four vertical feet of the root-system was thus finely exposed. After several days spent in examining a score or more large trees that had been thus denuded, I became convinced that the most important function of the cypress knee is to stiffen and strengthen the root, in order that a great tree may anchor itself safely in a yielding material.

The word "anchor" is indeed an apt one here; for the living root, curved to its work, and firmly grasping the sandy bottom, suggests vividly the best bower-anchor that a man-of-war may throw into similar loose sands, when threatened by the very atmospheric forces that the *Taxodium* has been fitting itself to resist since tertiary times. Professor Shaler, in a most interesting treatise on the nature and associations of *T. distichum*, shows that the cypress which existed in the miocene age has since then probably gradually changed its habitat from the drier ground to the swamp areas.

Truly a most admirable and economical arrangement to stiffen and strengthen the connection between the shank of the anchor and its fluke is this knee; and usually in the living anchor the fluke branches or broadens as it descends, so that its effectiveness is greatly increased, like the sailor's anchor of many flukes, or the "mushroom anchor" that he may have learned to depend upon where the bottom is softest.

The accompanying picture is from a photograph that I made in 1887 of the lower portion of a tree that rises some seventy feet above the shore line of Lake Monroe. The original surface of the sand was near the level of the higher roots. The picture shows the manner in which this peculiar species throws out horizontal roots from its conical (usually hollow) buttressed base. At different distances from this conical base these horizontal roots project strong branches more or less perpendicularly into the earth. Where such perpendicular "flukes" branch from the main horizontal "shank," it will be seen, there is formed a large knob, which is the "knee" under discussion. This knee, when fully developed, is generally hollow, comparatively soft, gnarled, and very difficult to rupture, so that it has the quality

of a spring that becomes more rigid as it is extended or compressed out of its normal shape. My friend Thomas Meehan informs me (Dec. 17, 1889) that he has "observed a case where the interior hollow makes an annual layer of bark equally with the exterior," and he is of the opinion that "it is by the decay of the outer layer of this inside course of bark after several years that the knob becomes hollow." If this habit is general, it is an admirable means of forming and of preserving undecayed, at the smallest cost to the tree; a living elastic strengthener at the forking of the roots. When in a hurricane the great tree rocks back and forth on its base, and with its immense leverage pulls upon this odd-shaped wooden anchor, instead of straightening out in the soft material, as an ordinary root might, thus allowing the tree to lean over and add its weight to the destructive force of the storm, it grips the sand as the bower-anchor would do, and resists every motion. The elasticity at the point of junction allows one after another of the perpendicular flukes attached to the same shank to come into effective action, so that before being drawn from the sand or ruptured the combined flukes present an enormous resistance.

The drawing opposite I have made for the purpose of simplifying the discussion. It shows a hypothetical cypress with two roots of the same length and diameter,—one with knees, the other without them. The superior strength of the stiffened root would seem sufficiently evident; but, with the view of obtaining the judgment of a mind thoroughly trained in questions of this nature, I submitted the drawing to my friend, Charles Macdonald, late director of the American Society of Civil Engineers, whose eye has been accustomed to estimating the value of strains in structures by an active experience of twenty-five years, and who has just finished the largest drawbridge in America, at New London. Mr. Macdonald agreed with me that the root B, which is trussed with the knees C and C', would very largely exceed in capacity for holding the tree firmly in yielding material the root A, which is similar but destitute of knees. This greatly increased security against destruction by storms is, I think, a sufficient advantage to account for the existence and maintenance of an organ that draws so slightly upon the vitality of the plant.

It is proper to record here another observation that may explain the existence of the elevated, narrow point which the knee sometimes develops, and which rises higher than the curved growth that would be necessary to secure the maximum resistance to compression and extension. The home of the cypress is in broad level river-margins subject to periodic overflow, where hundreds of square miles become covered with a shallow bed of slowly moving water, or in basin-like depressions, sometimes of vast extent, where from time to time water rises above the level of the horizontal roots. Then these stake-like protuberances, rising into and through the current formed by the drainage or by the winds, catch and hold around the roots of the parent trees many thousand pounds of "plant-food" in the form of reeds and grass, or small twigs among which dead leaves become entangled. The tree that exclusively possesses this source of nutrition is at an advantage over all others in the neighborhood; and the higher these attenuated "drift-catchers" rise in the stream, the more drift will they arrest, for the highest stratum of water is richest in float. The theory that some distinguished writers have suggested that the knee is a factor in the aëration of the sap and that the tree's death is prevented by such aëration taking place in the upper portion of the knee during periods of high water, would seem to need careful experimental confirmation. Where Nature forms an organ whose purpose is to preserve the life of the individual, she takes special care to adapt such organ to the function it is depended upon to perform. In this case the rough, dry bark of the knee offers a most imperfect means of access for the oxygen or other gases of the atmosphere to the interior vessels of the plant, and instead of presenting broad surfaces of permeable membrane, formed for transmitting elastic fluids, at its upper extremity the protuberance becomes more narrow, and presents less surface as it rises, so that when, during periods of high water, the life of the tree is most jeopardized, the life-saving organ attains its minimum capacity. In the presence of this mani-

fest want of adaptation, it also seems important for the acceptance of the aërating theory, that some one should experimentally show that the aërating organ of the cypress really aërates to an extent sufficient to make it of material advantage to the plant. The chemical theory of the cypress knee seems to be but a revival of the elaborate hypothesis of Dickinson and Brown, published in their memoir on *T. distichum* in the *American Journal of Science and Arts*, in January, 1848. These industrious observers discard the mechanical theory entirely, and consider both the spongy knees, and, strangely enough, even the spreading base of the tree, as organs of communication with the air, forgetful that the successful and most celebrated lighthouse in the world—the Eddystone—was avowedly modelled after a similar spreading tree-base for the purpose of withstanding the storm shocks of the English Channel. By means of a curious drawing they show how the swollen portions of the base rise "to the top of the highest water level, which must, in some instances, attain an elevation of at least twenty-five feet;" thus continuing the functions and the structure of the knees, "up the body of the tree to the atmosphere."

It was long ago observed that no knees are developed when the tree grows in upland upon a firm bottom, in which ordinary simple roots can obtain in the ordinary way the hold necessary to resist overturning forces, and where there is no stratum of water to transport food. So conservative is Nature, that she reverts to an original or adopts a simpler form of root even in a single generation, if the need for the more complicated arrangement ceases to exist.

Finally, I may perhaps be permitted to add an observation regarding the roots of other trees that trench upon the same soils affected by the cypress, and often take advantage of the anchors it sets so boldly in treacherous bottoms. These trees project their cable-like, flexible roots in every direction horizontally, interlacing continually until a fabric is woven on the surface of the soft earth like the tangled web of a gigantic basket. Out of this close wicker-work, firmly attached to it, and dependent for their support upon its integrity, rise the tree-trunks. Thus slowly, and by a community of growth and action, a structure is formed that supplies for each tree a means of resisting the storms. Such communities of trees, provided with ordinary roots, advance against and overcome enemies where singly they would perish in the conflict. The cyclone, the loose sand, the morass,—these are the enemies they contend with, as it were, in unbroken phalanx, shoulder to shoulder, their shields locked, their spears bristling against the foe; but the graceful plumed cypress, the knight-errant of the sylvan host, bearing with him his trusty anchor,—the emblem of hope,—goes forth alone and defiant, afar from his fellows, scorning the methods of his vassals, and planting himself boldly amid a waste of waters, where no other tree dare venture, stands, age after age, erect, isolated, but ever ready to do battle with the elements. Twenty centuries of driving rain and snow and fierce hurricane beat upon his towering form, and yet he stands there, stern, gray, and solitary sentinel of the morass, clinging to the quaking earth with the grasp of Hercules, to whom men were building temples when his wardenship began.

ROBERT H. LAMBORN.

THE GESNER RUST-PROOF PROCESS.

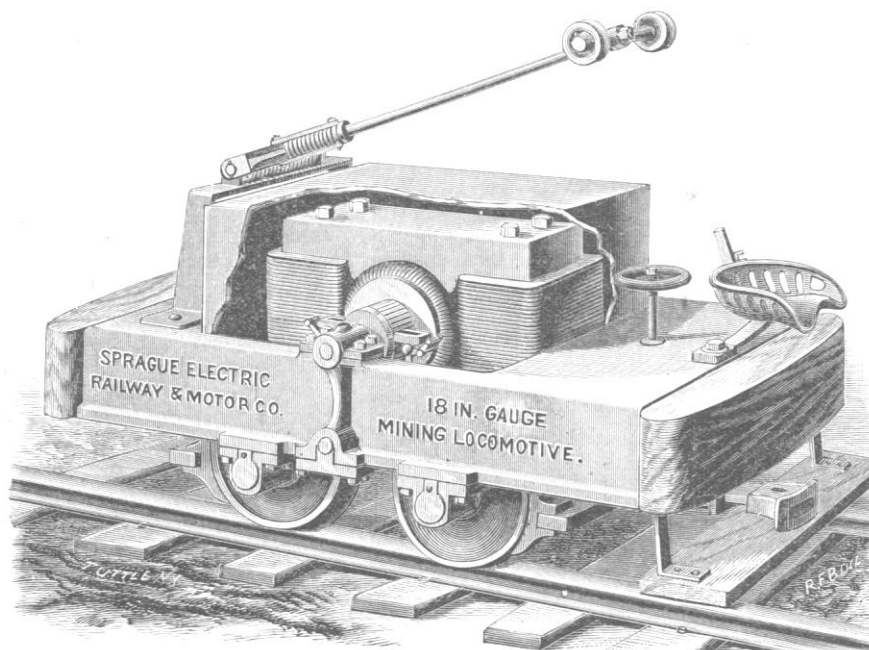
In *Science* of Dec. 27, 1889, we printed a report by Professor Haupt on the hydrogen process of protecting iron against corrosion. Since that report was made, a long and exhaustive series of experiments have been carried out by Dr. G. W. Gesner of this city, with the result of greatly improving the process, making it more uniform in its effects, simpler in operation, and less expensive in cost. The general features of the process are the same as described in Professor Haupt's reports, but the operations have been so simplified that the process may now be worked on a commercial scale by any workingman or laborer of ordinary intelligence, after a little practice and instruction.

Dr. Gesner has now in constant operation in Brooklyn a plant

for the treatment of iron and steel by this process. As the plant is small at present, attention is mainly given to small articles, such as steel and iron shingles for roofing, builders' hardware, artistic ironwork, furniture springs, polished parts of steam-engines and other machinery, boiler-tubes, nuts and bolts, water-meters, steam-radiators, and similar easily handled articles; but the intention is to apply the process, on a larger scale, to architectural and structural iron and steel, telegraph wire, and probably to iron and steel plates for boiler construction, ship-building, and similar uses.

As described by Professor Haupt and Dr. Gesner, this process does not produce a magnetic oxide upon the surface of the metal, as is the case in other processes for making iron rust-proof, nor does it alter the dimensions of the articles treated. It changes the body of the surface of the metal into a compound of hydrogen, iron, and carbon, which is designated a double carbide of hydrogen and iron, as determined by analysis. Being an integral part of the metal, it cannot scale or peel off; and it prevents indefinitely the rusting of the metal through exposure to the

necessary to reproduce here, it being sufficient to summarize the results as given in the report. "The pieces were gauged both before and after treatment, and showed no change. The tests show practically no effect whatever upon the iron, with the exception of a slight decrease in the elongation. As the area is not reduced, it would be impossible, without further evidence, to say whether or no the ductility were affected. At any rate, the ductility being so low, this small reduction, if proved to exist, would be of comparative unimportance in affecting the value of the metal. The steel is benefited. The annealing undergone during the treatment has softened it to some extent. It has lost about five per cent in strength, but gained five per cent in elongation. This metal, as originally, would not have come up to specifications, being insufficient in stretch. The treatment has not reduced the tensile strength below the assigned limit, at the same time it has brought the elongation up to requirements. Pieces of both iron and steel were bent cold to an angle of forty-five degrees without showing any fracture or scaling of the treated surface."



THE STOREY ELECTRIC MINING LOCOMOTIVE.

weather, steam, damp earth, etc. It is also found that cast iron is to some extent annealed in the process, and its pores filled, so that thin cast-iron pipe which before treatment would leak at five pounds pressure per square inch, will stand a pressure of fifty pounds without leakage after undergoing the process. It also improves the quality of steel.

The following is the report of Barton H. Coffey, M.E., of the Henry Warden Iron Works, Philadelphia, on the results of tests to determine the effect of the hydrogen treatment on the physical properties of iron and steel:

"These tests were determined upon to decide if the hydrogen anti-corrosive treatment had any adverse effect, and if so to what extent, upon the strength and resilience of wrought iron and steel suitable for boiler, ship, and bridge purposes. Five test-pieces of iron were cut from a single plate one-half inch thick, and five more similarly from a three-eighth inch steel plate. These were machined to suitable sizes for the standard eight-inch test-piece, giving a section of about .71 of a square inch for the iron and .51 of a square inch for the steel. Three of each of these sets were forwarded to Dr. Gesner for treatment, who retained one and returned the remainder. The tests were made with a 200,000-pound Olsen machine, and the measurements with Brown & Sharpe micrometer gauges, and are believed to be accurate."

The results were recorded upon test-blanks, which it is un-

In conclusion, the report says, "The hydrogen process does not affect the value of iron and steel for engineering purposes. The treatment benefits steel by the annealing undergone in the process. The treated surface possesses elastic properties of the highest value."

ELECTRIC LOCOMOTIVE FOR METAL MINES.

WE show in another part of this issue a view of a new electric rotary diamond drill, manufactured by the Sprague Electric Railway and Motor Company of New York, which has shown gratifying results in the tests to which it has been put, and which promises to fulfil a long-felt want in electric mining. On this page we show another special electric mining application; i.e., an electric locomotive. This locomotive is simple, powerful, and compact, and is built with special reference to the rough usage and arduous duties required of such a machine.

The gauge of the accompanying locomotive is eighteen inches, but it can be accommodated to any gauge in ordinary commercial work. In order to protect the machine from damage, all the working parts are completely boxed in, as shown in the view. The speed of the motor is under complete control by a switch which throws the winding of the field into

different electrical combinations, thus varying the speed of the motor without the use of any wasteful resistance. The direction of rotation is also governed by the same switch, so that the operation of the motor is very simple, and it can be put in charge of an ordinary workman.

Any system of conveying the current from the dynamo to the locomotive can be used, either using the rails as one side of the circuit for the return of the current, or else employing a complete metallic circuit by the use of a double overhead trolley wire. In this latter case, a trolley pole, shown in the view, carrying at its upper end two trolley wheels for making running contact with the overhead wires, is attached on the rear of the locomotive car.

This mining locomotive is now being manufactured by the Sprague Electric Railway and Motor Company from designs made by Mr. I. E. Storey. One of the most noticeable advances made in modern mining science is the adoption of electricity as a medium for transmitting power and producing light, and

the same wires which supply current to the drill, and, when in such use, are connected in multiple arc across the main current wires.

These drills are manufactured and sold by the Sprague Electric Railway and Motor Company of New York, under patents granted to Mr. I. E. Storey. We understand that the Sprague Company is now at work on, and will soon be able to furnish, a number of special mining applications, among which is an electric percussion drill.

THE LATEST THEORIES ON THE ORIGIN OF THE ENGLISH.¹

WHEN, one is sometimes tempted to ask in sheer weariness, will any man be able to say the last word on that question of the West which bids fair to be as eternal as any question of the East, — the question whether we, the English people, are ourselves or somebody else? That formula is not a new one.



ELECTRIC MINING DRILL.

such applications as the above indicate the growing demand of mining companies for just such apparatus, and the ability of the leading electric companies to supply the need.

ELECTRIC ROTARY DIAMOND DRILL.

THE accompanying view shows a new electric mining rotary drill which has shown good results in experimental work, and which will soon be applied to regular mining-work in several leading mines.

A good electric mining drill has always been desired by miners, and this drill seems to meet all the requirements. It is light, compact, simple, and easy to operate. The motor is completely incased, so that it is impossible for dust, dirt, or stray stones to lodge in the working parts. The whole drill is mounted on an adjustable frame, so that it can be very easily set in any position desired, or set at work at any part of the mine.

The current for operating the drill is supplied at a constant voltage or potential, the number of volts depending on the potential used for transmitting power throughout the mine. If lamps are needed, they can be supplied with current from

Some of us have, in season and out of season, through evil report and good report, been fighting out that question for not a few years. If it is wearisome to have to fight it out still, there is some little relief in having to fight it out in a wholly new shape and with a wholly new set of adversaries. It is an experience which has at least the charm of novelty when we have to argue the old question, who are we, whence we came, from a point of view which might make it possible, with the exercise of a little ingenuity, to avoid ever using the words "Celt," "Briton," or "Roman" at all. On the other hand, the strife in its new form has become more deadly; the assault has become more threatening. Hitherto we have fought for victory, for dominion, for what, if one adopted the high-polite style of a lord mayor's feast, one might call "the imperial instincts of the Anglo-Saxon race." We have had to fight to prove our greatness against people who told us that we were not so great as we thought. Angles and Saxons, we were told, were only one element, perhaps a very inferior element, in the population of Britain. Still nobody denied that we had some place in the world, some place in this island. It might be a very small place compared with that of the Celt who went

¹ From The Contemporary Review for January.

before us, or of the Norman who came after us. Still we had some place. Nobody denied that there had been Angles and Saxons in the isle of Britain. Nobody denied that those Angles and Saxons had had some share in the history of the isle of Britain. Nobody—save, I believe, one thoroughgoing man at Liverpool—denied that those Angles and Saxons had supplied some part, however mean a part, to the tongue now spoken over the larger part of Britain. Nobody, I fancy, ever denied that to the mixed ancestry of the present inhabitants of Britain, Angles and Saxons had contributed some elements, however paltry. The fight seemed hard, and we did not know that there was a harder fight coming. For now the strife is not for victory or dominion, but for life. The question is no longer whether Angles and Saxons have played a greater or a less part in the history of Britain: it now is, whether there ever were any Angles or Saxons in Britain at all, perhaps whether there ever were any Angles or Saxons anywhere; or, more truly, the question takes a form of much greater subtlety. Our new teachers ask us, sometimes seemingly without knowing what they are asking, to believe a doctrine that is strange indeed. The latest doctrine, brought to its real substance, comes to this: we are not Angles and Saxons; we did not come from the land of the Angles and Saxons; we are some other people who came from some other land; only by some strange chance we were led to believe that we were Angles and Saxons, to take the name of Angles and Saxons, and even to speak the tongue which we should have spoken if we had been such. Or, to come back to the old formula with which we began, we are not really ourselves, but somebody else; only at some stage of our life we fell in with ingenious schoolmasters, who cunningly persuaded us that we were ourselves.

On the old controversy I need not enter again now. That controversy might have been much shorter if clever talkers would have taken the trouble to find out what those whom they were talking about had really said. Many statements have been made, many jokes have been joked, many outcries have been raised, some ingenious names have been invented, nay, even some arguments have been brought, and all about doctrines which no man in this world ever held. Personally I have nothing more to say on the matter. I have had my say: any body that cares to know what that say is may read it for himself.¹ I will make only one remark on a single statement which I have casually lighted on, and which is, on the whole, the very strangest that I have ever seen. I find in a volume of a series which comes under the respectable name of "The Society for Promoting Christian Knowledge"—a series to which Oxford professors and examiners contribute, a book which has a book by Mr. Rhys before it and a book by Mr. Hunt after it—this amazing saying: "Florence uses the strange expression that Eadgar was chosen by the Anglo-Britons."² Strange indeed if Florence had ever used it; but to say that he did use it surely goes beyond the admitted literary and "stylistic" license of making people, old or new, say what they never did say. But the saying is instructive: it shows how some writers, sometimes more famous writers, now and then get at their facts. One received way is to glance at a page of an original writer, to have the eye caught by a word, to write down another word that looks a little like it, and to invent facts that suit the word written down. To roll two independent words into a compound word with a hyphen is perhaps a little stronger, but only a little. Florence says some thing about Englishmen in one line, and something about Britains in another line not far off. Roll them together: make a new fellow to Anglo-Saxons and Anglo-Catholics, and we get the "strange expression," and the stranger fact, about Eadgar and the "Anglo-Britains." Yet even with a creator of "Anglo-Britons" we may make peace for the present.

¹ I must refer to what I have said on "Teutonic Conquest in Gaul and Britain" in "Four Oxford Lectures" (Macmillan, 1888), and to the essay on "Race and Language" in the third series of Historical Essays.

² Anglo-Saxon Britain, by Grant Allen, B.A., p. 147. The real words of Florence (959) are: "Rex Mercensium Eadgarus, ab omni Anglorum populo electus anno ætatis sue 16, adventus veri Anglorum in Britanniam quingentesimo, 363 autem ex quo sanctus Augustinus et socii ejus in Angliam venerunt." No words could be more carefully chosen.

There is allowed to be something "Anglo" in the matter; and that for the present is enough. The old question was, after all, simply one of less and more. There was some "Anglo" something, only how much? He who shall say that the present English-speaking people of Britian are Angles and Saxons who have assimilated certain infusions, British and otherwise, and he who shall say that the English-speaking people of Britian are Iberians, Celts, Romans, any thing, who have received just enough of Anglian and Saxon infusion to be entitled to be called "Anglo Britons," maintain doctrines that differ a good deal from one another. Still it is only a difference in degree. Both sides may encamp together in the struggle with the new adversaries. Whether the Angle assimilated the Briton or the Briton assimilated the Angle, there was some "Anglo" element in the business. It is serious for both to be told that there never was any "Anglo" element at all; while, according to one view, there could hardly have been Briton enough to have the "Anglo" element, if there had been any, hyphenated on to him.

We have in this matter to deal with two writers, whom it may seem somewhat strange to group together. M. Du Chaillu has startled us, one may venture to say that he has amused us, by a doctrine that a good many tribes or nations which have hitherto gone about with tribal or national names had no right to any national names at all, but only to the name of an occupation. The Franks of the third century, the Saxons of the fifth, were not Franks or Saxons, but "Vikings." Being "Vikings," they may have been Suiones, Swedes, Danes, Norwegians: but the chief thing is to be "Vikings;" they belong to the "Viking age." On this teaching I shall say a few more words presently. I want just now to point out that, according to the Viking doctrine, we must have come from lands farther to the north than we have commonly thought. And this doctrine I wish to contrast with another, which has been less noticed than one might have expected, according to which we must have come from lands much farther to the south than we have commonly thought. Of these two doctrines, the first comes to this, that Angles and Saxons are all a mistake. There was no migration into Britian from the lands which we have been taught to look on as the older England and the older Saxony: the name of Angle and Saxon came somehow to be wrongly applied to people who were really Suiones or others entitled to be called Vikings. I am not sure that I should have thought this doctrine, at least as set forth by M. Du Chaillu, worthy of any serious examination, had it not been for the singular relation in which it stands to the other slightly older teaching, which, when we strive to obey the precept, "*Antiquam exquirite matrem*," bids us look, not farther to the north than usual, but farther to the south. According to this teaching, there may have been some Saxons from North Germany among the Teutonic settlers in Britian, but the main body came from a more southern land. These two doctrines, very opposite to one another, but both upsetting most things which we have hitherto believed, have been put forward in a singularly casual way. Some will perhaps be a little amazed when for the southern doctrine I send them to Mr. Seebohm's well-known book, "The English Village Community." There it certainly is: it is not exactly set forth by Mr. Seebohm, but it has at least dropped from him; and the opposite doctrine has not much more than dropped from M. Du Chaillu. Both teachings are thrown on the world in a strangely casual sort, as mere appendages to something held to be of greater moment. Still M. Du Chaillu does put forth his view as a view; Mr. Seebohm lets fall his pearls, if they be pearls, seemingly without knowing that they have fallen from him. I am not going to discuss any of Mr. Seebohm's special theories, about manors or serfdom, about one-field or three-field culture. Mr. Seebohm's views on these matters, whether we accept them or not, are, as the evident result of honest work at original materials, eminently entitled to be weighed, and, if need be, to be answered. And in any case we can at least give our best thanks to Mr. Seebohm for his maps and descriptions of the manor of Hitchin, a happy survival in our day of a state of

things which in most places has passed away. What I have to deal with now, as far as Mr. Seeböhm is concerned, is to be found in one or two passages in his book, in which, as I have hinted, he lets fall, in a perfectly casual way, doctrines which go far to upset all that has hitherto been held as to the early history of the English folk.

Now, a wholly new teaching on such a matter as the beginning of our national life in our present land is surely a matter of some importance. If it is true, it is a great discovery, entitled to be set forth as a great discovery, with the proudest possible flourish of trumpets. The new teaching should surely be set forth in the fullest and clearest shape, with the fullest statement of the evidence on which it rests. But with Mr. Seeböhm the new doctrine drops out quite suddenly and incidentally, as a point of detail which does not very much matter. The belief as to their own origin which the English of Britain have held ever since there had been Englishmen in Britain seems to Mr. Seeböhm not to agree with his doctrines about culture and tenures of land. It is by no means clear that there is any real contradiction between the two, but Mr. Seeböhm thinks that there is. He is so convinced of the certainty of his own theory, that the great facts of the world's history must give way if they cannot be reconciled with it. The strange thing is, that Mr. Seeböhm does not seem the least proud of his great discovery: he hardly seems to feel that he has made any discovery. He is less excited about a proposition which makes a complete revolution in English history than some are when they think that they have corrected a date by half an hour, or have proved some one's statement of a distance to be wrong by a furlong. All turns on the "one-field system" and the "three-field system." The three-field system existed in England, it existed in certain parts of Germany; but it did not exist in those parts of Germany which were inhabited by Angles and Saxons. Therefore, if Britain had any Teutonic settlers at all, they must have come from some other part and not from the land of the Angles and Saxons. Only, to judge from Mr. Seeböhm's tone, the question whence they came, or whether they came from anywhere, is a question hardly worth thinking about, compared with matters so much more weighty as the system of "one-field" or of "three."

Our first foreshadowing of what is coming is found at p. 372 of Mr. Seeböhm's book: "Now, possibly this one-field system, with its marling and peat-manure, may have been the system described by Pliny as prevalent in Belgic Britain and Gaul before the Roman conquest, but certainly it is not the system prevalent in England under Saxon rule. And yet this district where the one-field system is prevalent in Germany is precisely the district from which, according to the common theory, the Anglo-Saxon invaders of Britain came. It is precisely the district of Germany where the three-field system is conspicuously absent. So that although Nasse and Waitz somewhat hastily suggested that the Saxons had introduced the three-field system into England, Hanssen, assuming that the invaders of England came from the north confidently denies that this was possible. The Anglo-Saxons and the Frisians and Low Germans and Jutes who came with them to England cannot (he writes) have brought the three-field system with them into England, because they did not themselves use it at home in North-west Germany and Jutland." He adds that even in later times the three-field system has never been able to obtain a firm footing in these coast districts."

It is wonderful indeed to find the origin of the English people thus dealt with as a small accident of questions about marling and peat manure. Hanssen confidently denies that the Angles and Saxons could have brought the three-field system into Britain from their old home; and, if it be true that the three-field system was never known in their older home, he assuredly does right confidently to deny it; only why should so much be made to turn on the different modes of culture followed

in the continental and the insular English land? If the one-field system suited the soil of the old Angeln and the old Saxony, while the three-field system better suited the soil of East Anglia or Sussex, surely our Angles and Saxons would have sense enough to follow in each land the system which suited that land. If they found that the kind of husbandry which suited the soil of their old home did not suit the soil of their new home, they would surely invent or adopt some other kind of husbandry which did suit it. But in any case, if the acceptance of a certain doctrine about the "one-field system with its marling and peat-manure" involves nothing short of all that Mr. Seeböhm assures us that it does involve, it would surely have been worth while to think about the marling and the peat-manure a second time by the light of what had hitherto been looked on as the broad fact of the history of England and Europe. These last may be wrong; but they are surely at least worthy of being thought over before they are cast aside. But with Mr. Seeböhm the "common theory" — that is, the recorded history of the English people — is not worth a thought: it may go anywhere. "Hanssen assumes that the invaders of England came from the north." That will do for the present: let them come from any land, so that it be not a land that practises "the one-field system with its marling and peat-manure."

Some way further on (p. 410) Mr. Seeböhm has another passage, in which, seemingly with the same words of Hanssen before him, he throws out, still very casually but not quite so casually as before, an exactly opposite doctrine: "We have already quoted the strong conclusion of Hanssen that the Anglo-Saxon invaders and their Frisian Low German and Jutish companions could not introduce into England a system to which they were not accustomed at home. It must be admitted that the conspicuous absence of the three-field system from the north of Germany does not, however, absolutely dispose of the possibility that the system was imported into England from those districts of middle Germany reaching from Westphalia to Thuringia where the system undoubtedly existed. *It is at least possible that the invaders of England may have proceeded from thence rather than, as commonly supposed, from the regions on the north coast.*"

It is hardly worth while to stop to comment at any length on the confusion of thought implied in such phrases as "Anglo-Saxon invaders of England." As there can be no *Anglia* till there are *Angli*, they would literally imply that a band of Angles first came into Britain by themselves, that they set up an England therein, and then sent to their hyphenated kinsfolk on the mainland to come after them to share, and doubtless to enlarge, that England. But of course what Mr. Seeböhm means by "invaders of England" are those who out of part of Britain made an England for certain later people to invade. We have got back to the days of our grandmothers, when our little books told us how Cæsar was "resisted by the English people, who were then called the Britons." We have perhaps got back to the days of good old Tillemont, who attributes all that was done on the native side during the Roman occupation of Britain to "les Anglois." The confusion, however, belongs to the German writer: Mr. Seeböhm simply copies him. And in one point, Mr. Seeböhm, after some striving with himself, has corrected a still stranger confusion of his guide. In his first edition the *Niedersachsen*, which Hanssen so oddly couples with *Angelsachsen* appear in one place as "Low-Germans," in another as "Low-Saxons." In a later revision the "Low-Saxons" have vanished.¹ But to couple "Low-German" (the whole) with Anglo-Saxons, Frisians, etc. (each of them parts of that whole) is, as a logical division, even stranger than to couple *Angelsachsen* and *Niedersachsen*. This last phrase implies "High-Saxons" somewhere; and it might not be an ill guess that they are the same as the

(Continued on p. 75.)

¹ The text of Hanssen, *Agrarhistorische Abhandlungen*, i. 496, stands thus: "Allein die Angelsachsen und die welche mit ihnen nach England gezogen sein mögen; Friesen, *Niedersachsen*, Juten, können die Dreifelderwirtschaft nicht nach England mitgebracht haben, weil sie in ihrer Heimat selber in nord-westlichen Deutschland und Jütland nicht betrieben hatten."

¹ In Mr. Seeböhm's first edition, the word in the second extract was "Low-Saxon;" in the third it is "Low-German." Hanssen's word is *Niedersachsen*. If he is thinking of the circle of *Niedersachsen* in later German geography, it does not at all help him.

NOTES AND NEWS.

THE way in which foreign plants become "weeds," under new and favorable conditions, is illustrated by the recent case of *Melilotus alba* in our Western States. Introduced a few years ago as a garden-plant, it has spread so rapidly in the rich bottom-lands along the Missouri River, according to *Garden and Forest*, that it is fast driving out the sunflower and other native weeds. It is commonly called the "Bokhara clover."

—A meteorite of special interest to chemists has been examined by M. Stanislas Meunier. It fell at Migheni, in Russia, on June 9, 1889; and it was evident, from a cursory inspection, that it was of a carbonaceous nature. In external appearance, as stated in *Nature*, it exhibited a deep greenish-black color, relieved by numerous small brilliant white crystals. The surface was considerably wrinkled, and blown out into swellings. The material was very friable, and readily soiled the fingers. A section under the microscope was observed to consist largely of opaque matter interspersed with crystals of a magnesian pyroxene and peridot. Fine particles of metallic iron and nickeliferous iron were readily collected by a magnet from the powdered rock, having all the characteristics of meteoric iron. The density of the meteorite was not very high, 2.495. About 85 per cent of the rock was found to be attacked by acids, the portion so attacked being shown by analysis to consist mainly of a silicate of magnesium and iron having the composition of peridot. On the remaining 15 per cent being heated in a current of dry oxygen gas, it readily took fire and burnt brilliantly. The products of combustion, which were allowed to pass through the usual absorption tubes containing pumice and sulphuric acid and potash, showed that the meteorite contained nearly 5 per cent of organic matter. In order to obtain some idea as to the nature of the carbonaceous substance present, a quantity of the rock was powdered and then digested with alcohol. On evaporation the alcoholic extract yielded a bright yellow resin, which was readily precipitated from the alcoholic solution by water, and much resembled the kabbite of Wöhler. The most curious chemical properties of the meteorite, however, are exhibited with a cold aqueous extract of the powdered rock. The filtered liquid is quite colorless, but exhales a faint odor due to an organic salt which carbonizes on evaporation to dryness, and may be burnt upon platinum foil. The aqueous extract further contains nearly 2 per cent of mineral matter possessing properties of a novel character. Barium-chloride solution gives a heavy white precipitate, which, however, is not barium sulphate. Silver nitrate gives a voluminous curdy reddish-violet precipitate, reminding one of silver chromate, but of quite a distinct and peculiar tint, and which blackens in a very few minutes in daylight. The substance which exhibits these re-actions is unchanged by evaporation to dryness and ignition to redness, readily dissolving in water again on cooling, and giving the above re-actions. The silver-nitrate precipitate, when allowed to stand for some time undisturbed in the liquid, becomes converted into colorless but brilliantly refractive crystals, which polarize brightly between crossed nicols under the microscope, and which are insoluble in boiling water. The properties of this new substance contained in the water extract appear to approximate most closely to those of certain metallic tellurates, but the new compound appears also to differ in certain respects from those terrestrial salts.

—We owe a new and interesting application of photography to M. Bertillon, the well-known director of the Identification Department at the Paris Prefecture of Police. M. Bertillon has been devoting himself for some months to the study of the physical peculiarities engendered by the pursuit of different occupations. According to *Nature*, the police have frequently to deal with portions of bodies and it would greatly aid their investigations to be able to determine the calling of the murdered person in each particular case. The hand is, as a rule, the part naturally most affected by the occupation; and M. Bertillon has taken a very large series of photographs, each one showing on a large scale the hands, on a smaller scale the whole figure of the workman at his work, so that one may see

at a glance the position of the body, and which are the parts that undergo friction from the tools in use. From the hands of the navvy all the secondary lines disappear, and a peculiar callosity is developed where the spade-handle rubs against the hand; the hands of tin-plate workers are covered with little crevices produced by the acids employed; the hands of lace-makers are smooth, but they have blisters full of serum on the back and callosities on the front part of the shoulder, due to the friction of the straps of the loom; the thumb and the first joints of the index of metal-workers show very large blisters, whilst the left hand has scars made by the sharp fragments of metal. Experts in forensic medicine (Vernois among others) have before drawn attention to the subject; but this is the first time that an investigation has been carried out on a large scale, and in M. Bertillon's hands it should lead to the best results.

—Two new expeditions are announced in *Globus*, Bd. 65, No. vi. Joseph Martin has lately left Peking with a few companions for Lan-chow and Sin-ning, with the intention of reaching Tibet by the country of the Kuku Nor. The journey is undertaken for the purpose of geological and physical geographical investigations. This traveller is famous for his great journey in eastern Siberia, and in particular for his ascent of the Stanovoi Mountains. The well-known French traveller, Bonvalot, accompanied by Prince Henry of Orleans, has commenced a new journey in Asia, the aim of which is nothing less than to traverse the continent from north-west to south-east. The expedition is to proceed from Omsk through Semipalatinsk to Chuguchak on the Chinese frontier, then by Manas, Urumsai, Karashar, Korla, the Lob Nor, Chamuen-Tai, Kukusai on the upper Yang-tsi-kiang, Tsiamdo, Batang, and Yunnan, to the coast at Tong-king. M. Bonvalot is, however, quite aware that his plan may very probably have to be considerably modified.

—The grass known as "Lalang" (*Imperata cylindrica*) gives the foresters of the Malay Peninsula more trouble than our own prairie-grasses give the tree-planters of the West. This Lalang is injurious, says *Garden and Forest*, by reason of its inflammability, and because it prevents any cultivation of the land covered by it, except at great expense. Wherever land is allowed to run to waste, it is soon covered with this grass, except where the soil is wet, or sandy, or shaded by trees. The annual report of the conservator of forests at Singapore refers at great length to this plant, stating that it can be exterminated by chemicals; but these are expensive, and have an injurious effect upon the trees planted in forest upon the land afterward. When trees are large enough to throw a shade, the Lalang quickly disappears, and it cannot penetrate into forest glades if but a few trees bar its progress. The gradual planting of bushes and shade-trees is recommended as the surest remedy for this grass pest.

—An interesting study has been lately made by Herr Tarchenoff (*Pflüger's Archiv*) of electric currents in the skin from mental excitation. Unpolarizable clay-electrodes, connected with a delicate galvanometer, were applied to various parts, — hands, fingers, feet, toes, nose, ear, and back; and, after compensation of any currents which occurred during rest, the effects of mental stimulation were noted. Light tickling with a brush causes, after a few seconds' period of latency, a gradually increasing strong deflection. Hot water has a like effect; cold or the pain from a needle-prick, a less. Sound, light, taste, and small stimuli act similarly. If the eyes have been closed some time, mere opening of them causes a considerable deflection from the skin of the hand. Different colors here acted unequally. It is remarkable that these skin-currents also arise when the sensations are merely imagined. One vividly imagines, for example, he is suffering intense heat; and a strong current occurs, which goes down when the idea of cold is substituted. Mental effort produces currents varying with its amount. Thus, multiplication of small figures gives hardly any current; that of large, a strong one. If a person is in tense expectation, the galvanometer mirror makes irregular oscillations. When the electrodes are on hand or arm, a voluntary movement, such as contraction of a toe or convergence of the eyes,

gives a strong current. In all the experiments, says *Nature*, it appeared that, with equal nerve-excitation, the strength of the skin-currents depended on the degree to which the part of the skin bearing the electrodes was furnished with sweat-glands. Thus some parts of the back, and upper leg and arm, having few of these, gave hardly any current. Herr Tarchenoff considers that the course of nearly every kind of nerve-activity is accompanied by increased action of the skin-glands. Every nerve-function, it is known, causes a rise of temperature and accumulation of the products of exchange of material in the body. Increase of sweat-excretion favors cooling and getting rid of those products.

—In the summer of 1887 Herr Lindenbaum found a petroleum lake on a narrow tongue of land in the north of Saghalien. It is about twenty-two miles north-east of a village named Pomor, and at about 54° north latitude. A little south of Pomor lies Baikal Bay, a good harbor, which has a depth of eight feet at low tide, and could therefore be entered by small vessels. There would be no difficulty in making a road from this place to the petroleum lake. There is also another spot, one hundred and twenty-five miles south of the former, where petroleum is said to occur.

—Herr T. Thoroddsen was in the summer of 1889 travelling in Iceland, and has given an account of his discoveries in *Petterman's Mitteilungen*, Bd. 35, No xi. The part of the island he visited lies on the western edge of Vatna Jökull, to the north-east of Hecla. A great part of this country has never been visited by any one, for the total absence of grass for horses renders travelling difficult. All the lower slopes of Torfa Jökull are covered with lava and ashes, but the substratum and the ridge itself are composed of palagonite breccia and tuff. The large river Tungnaa approaches much nearer to Torfa Jökull than it is drawn on maps. Crossing this river, Herr Thoroddsen took up his quarters by the Fiskivötn, and made several excursions in the neighborhood. The lakes abound in trout; they are small, and are represented on the maps on too large a scale. They are not surrounded by glacial debris, but are almost all crater lakes. Across an extensive tract of lava, totally devoid of grass, lies the Thorisvatn, which is not a very small lake, as represented on Gunnlaugsson's map, but one of the largest in the island, and not much less than Thingvallvatn. The lakes are generally enclosed by steep mountains, so that it is difficult to approach them. It has been supposed that the rivers Skapta, Hversfisfjót, and Tungnaa rise at the same place from a glacier, and they are so represented on Gunnlaugsson's map; but Herr Thoroddsen found that the Tungnaa flows in two branches from a large glacier, the edge of which extends in a long curve from the mountains south of Vonarskard to those near Fljotshverfi, that the source of the Skapta lies about nine miles farther south, and that the Hversfisfjót rises from ten to fourteen miles still more to the south. Three serrated ridges run between the Tungnaa and Skapta, from the Vatna Jökull to the Torfa Jökull. These mountains are composed entirely of palagonite breccia, and the valleys are filled with volcanic ashes and shifting sands. Between the middle and southern ridges lies a lake about twenty-three miles long, which stretches nearly to the foot of Vatna Jökull, and, though in most places very narrow, is one of the largest in Iceland. It is fed with milky water by numerous glaciers. Near the last of these, Herr Thoroddsen, on his way to the Torfa Jökull, visited several warm springs and solfataras.

—The remark made at a recent meeting of the Royal Geographical Society by the president, *apropos* of certain explorations by Mr. Theodore Bent, viz., that there is still much work for the competent observer in regions where practically no risk need be encountered, is strikingly exemplified in the account of the last voyage of that accomplished explorer along the south coast of Asia Minor, as described in the *Journal of Hellenic Studies*. Sailing along the Carian coast, he landed in the bay of Aplotheke, at the ancient town of Loryma; and, hearing there of some ruins a few hours distant, he rowed to the place, and discovered a curious little harbor with the entrance not a

stone's throw in width. Thence an hour's walk brought him to some extensive ruins, which, from an inscription, he believed himself able to identify with tolerable certainty as Kasarea. The village of Phœnike being just beyond, he could also identify with certainty the little harbor as the *κρήσα λιμὴν* of Ptolemy; for this harbor lies, according to that geographer, between Loryma and Phœnike. Pliny also mentions that *Portus Cressa* lies just opposite Rhodes at a distance of twenty miles, which agrees with the position. Again, a little farther along the coast, on the Gulf of Makri, Mr. Bent was able, from inscriptions on the ruins, to identify the site of a Lycian town of some importance,—Lydæ, the capital of a district known as Lydatis. A little farther on, an old Hellenic acropolis, surrounded by a few tombs, seemed, from some half-defaced inscriptions, to have been known as Lissa, though the site seems to be that assigned by Ptolemy to the town of Karya. Some of the inscriptions found in these places are of considerable interest, and the remains are described by Mr. Bent to be not without artistic merit. The whole region is now inhabited only by nomad tribes of Yuruts; and these discoveries are alluded to here merely to show how much more may be done and discovered by the explorer, within easy reach of home, than is commonly supposed. Indeed, to quote Mr. Bent's words with reference to this district alone, "Inasmuch as Pliny tells us that there were once seventy cities in Lycia and in his time thirty-six, of which he only knew the names of twenty-five, there is room for much more geographical discovery in this interesting district."

—*Garden and Forest* states that it has received at its office, as a reminder of the mild winter, a very interesting photograph of a group of Christmas roses which came from Cazenovia, N.Y., to testify how beautiful these flowers can be in mid-winter. Branches of many shrubs with fully expanded flowers were also received; and in a collection of this sort from the Meehan Nurseries at Germantown were sprays of the Cornelian cherry with the yellow stamens showing through the opening buds, and the Tartarian honeysuckle with buds just opening.

—We learn from *Nature* that remarkable phenomena are witnessed at the new observatory on the steep and isolated Säntis in northern Switzerland. Thunder-storms are extremely frequent. Thus in June and July last year, only three days were without them. As a rule, thunder peals from mid-day till evening. The noise is short, partly owing to shortness of flashes, and partly to the small amount of echo. The thunder-storms come on quite suddenly, in a clear sky. One of the surest indications of their approach is the bristling of the observer's hair. During hail the iron rods of the house give a hissing sound associated with luminous effects.

—Messrs. Houghton, Mifflin, & Co. will issue in February, as an extra number of the Riverside Literature Series, "The Riverside Manual for Teachers," containing suggestions and illustrative lessons leading up to primary reading, by I. F. Hall, superintendent of scholars at Leominster, Mass. The manual will appear later as the introductory part of "The Riverside Primer and Manual for Teachers." It points out, principally by the aid of illustrative lessons, what steps the pupil should take before beginning the primer. The primer and manual form the first book of the Riverside Reading and Language Course, which also includes "The Riverside First Reader," "The Riverside Second Reader," and, for higher grades, the regular numbers of the Riverside Literature Series. To accompany the manual and primer, Mr. Hall has designed an instruction frame equipped with three sets of language and object pictures, prepared especially for this purpose by F. T. Merrill, script and printed words and sentences, and a displaying holder. The object of the Riverside Language and Reading Course is, first, to give young children such a training as will enable them, while overcoming the mechanical difficulties of learning to read, to acquire a taste for good reading-matter, and incidentally to gain a power to express themselves orally and in writing with accuracy, good taste, and facility; and, second, to supply children of each grade with the best reading-matter that the world's literature affords.

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M. DU CHAILLU ON THE VIKING AGE.

THE following from Mr. Du Chaillu, written to the editor of *The London Times*, appeared in that journal for Jan. 7:—

"As some misunderstanding has arisen in regard to the historical chapters of my book on 'The Viking Age,' will you allow me to give some fuller explanation of my views in regard to the earlier inhabitants and invaders of Britain?

"In studying the history and antiquities of any country which at some previous period has been overrun and occupied by a foreign power, we naturally expect to find some material traces of the invader, in the shape of monuments, inscriptions, graves, weapons, ornaments, etc. Thus Roman remains are plentiful in Germania, Gallia, and Britain, and in generations to come British remains will doubtless be found in India to tell the tale of England's dominion there. In like manner I argue that the archæological remains found in England form the strongest evidence as to who were the people who invaded Britain. The so-called Saxon, Anglo-Saxon, Anglo-Roman objects found in the British Isles correspond, down to the minutest detail, with objects found in Scandinavia and in the islands of the Baltic, and in no other place where Norsemen have not been.

"The majority of the criticisms which have come under my notice deal in sweeping statements concerning language, the views of historians, and so forth; a few have here and there ventured on the discussion of a point of detail; but none, so far as I am aware, have attempted to deal with one of my chief arguments, which is based upon the existence of the material remains to which I have referred above. The first of the maritime tribes of the north mentioned by Roman writers was the Suiones, the Sviar of the Sagas. Tacitus describes their ships, and his description exactly coincides with the vessel found at Nydam, of which an illustration is given at

p. 220 of my first volume. My hypothesis that the Veneti of Cæsar were probably the advanced guard of the north is based upon the evidence that their ships, as described by Cæsar, correspond in a remarkable manner with the ships of the Norsemen.

"It is reasonable to suppose, as Tacitus makes no mention of these Suiones having come into conflict with the Romans, and as he informs us that they 'honored wealth,' that those he saw came for the purpose of trading; and this is confirmed by the quantities of Roman objects, and especially of Roman coins, distributed in finds and hoards throughout Scandinavia. To take one example only: the hoards at Hagestaborg and Singdarfe include upward of 24,000 Roman coins, forming an almost unbroken series from the time of Nero (54 A.D.) to that of Septimus Severus (211 A.D.), and none of later date. Other finds throughout the country exhibit a succession of Roman and Byzantine coins, including many of gold and silver, from the time of Augustus down to the later days of the Eastern Empire.

"Now, the general distribution of the coins and manufactured articles, and the large number of them, show, I maintain, that not the Suiones, or any one tribe alone, but all these tribes, carried on an extensive warfare and continuous commercial intercourse with the Roman Empire. The Romans, on the other hand, never penetrated into their country, their knowledge of them was very vague, and Roman writers selected a tribe here and there (as, for example, these very Suiones), and attributed to them certain characteristics and customs which in fact prevailed throughout Scandinavia. This vagueness of nomenclature is exhibited in the fact that the name Suiones disappears from history for seven centuries, until we find it again in the pages of Eginhard, who writes, 'The Danes and Suiones, whom we call Northmen.' Meanwhile, other names, as Franks and Saxons, are given to hordes of invaders and warriors whose origin and home are wrapped in mystery.

"Another point of great importance in this discussion is the enormous number of graves scattered all over the country of the Norsemen, indicating a very dense population.

"Now, it is reasonable to draw three conclusions from this evidence, which I have merely sketched in outline: (1) that we find from the days of the earliest Roman historians continuous traces of a maritime people in the north whose country the Romans and their successors never were able to invade; (2) that the Roman and early mediæval nomenclature, as bearing on this people, is so vague as to be worthless for historical purposes; (3) that the country, when we gain access to it, is found to be full of material remains indicative of a dense and warlike population, of advanced civilization, and of continuous intercourse with the outer world.

"Turning to England, we find copious remains from a very early date which are not British nor Celtic nor Roman, which have been variously labelled as Saxon, Anglo-Saxon, Anglo-Roman, and so forth, but which correspond minutely with the remains which I have described in the north. Of every such object found in England I claim that I can produce the counterpart in Scandinavia, and I challenge the historians and archæologists to show me any place in the basins of the Elbe, the Weser, and the Rhine where corresponding objects have been discovered.

"I ask again, is it or is it not reasonable to infer that these remains found in England indicate that England was invaded from the north? Is it or is it not reasonable to hold that these invaders came, not from any one special spot in the north, but that their expeditions were made jointly by many tribes combining for the purpose, as we learn from the Sagas was their customary practice?

"I have taken pains to make no statement which cannot be supported by a quotation of some recognized authority, or by reference to some established fact, and these materially corroborate each other, yet I am accused of bringing forward crude and ignorant theories.

"In conclusion, I would ask my opponents to prove to me that their account of the origin of the English people is any thing more than a theory; and, if so, I challenge them to produce the facts on which it is based."

THE LATEST THEORIES ON THE ORIGIN OF THE
ENGLISH.

(Continued from p. 71.)

"Anglo-Saxon invaders of England," who came from somewhere in middle Germany. Only how is this doctrine to be reconciled with the "assumption" that "the invaders of England came from the north"? Taking it by itself, the southern theory comes to this: the main body of the invaders, "Anglo-Saxons," "High-Saxons," whatever they are to be called, started from middle Germany, from some point between Westfalia and Thuringia, from some part far away from marling and peat-manure; but on their road to Britain they fell in with certain companions, — Frisians, Low-Saxons, Jutes, — all seemingly from the marling and peat-manure country. In company with them, they came into Britain, to a part of it which had somehow already become "England."

This seemingly is the doctrine which is casually thrown out in the second of our quotation from Mr. Seeböhm. Now, if we could only get rid of hyphenated words, and talk simply of "Angles" or "English," it would help Mr. Seeböhm's case not a little. The odd thing is, that, in arguing against Mr. Seeböhm's case, one has first to put together his case for him. In his casual way of putting things, he does not seem to know how much might have been really said on behalf of something very like the view which he lets fall. In the older edition of Spruner's "Atlas," Mr. Seeböhm would have found an English land marked for him in the very part of Germany where he would have most wished for it. There was an *Angeln* shown clearly enough between Westfalia and Thuringia, and whatever was to be said about the branch of the Angles who were held to have dwelled there was carefully brought together by Zeuss.¹ Unluckily this inland *Angeln* has vanished from the revised Spruner-Menke, as also from the new atlas of Droysen. It might therefore be dangerous to build any theories on the subject without going deeply into the whole question; but just such an *Angeln* as suited Mr. Seeböhm's theory was there, according to the best lights, at the time that Mr. Seeböhm wrote. If he was not aware of this, his stumbling by an *a priori* road on a doctrine actually supported by such respectable authorities is one of the strangest of undesigned coincidences. If he was aware of it, it is almost more strange that he should not have thought it worth while to refer to a fact or supposed fact of so much value for his case. With its help, that case could be put in a very taking shape. These central Angles, used to a three-field system, set out to go somewhither, it need not have been to Britain. On the road they fall in with companions, Saxons, Low-Saxon, Frisian, Jutish, any thing else. These seafaring folk would doubtless know the way to Britain much better than the Angles of middle Germany. They suggest the course that the expedition should take, and the united force crosses the sea in as many keels as might be needful. It may even be, if anybody chooses, that the inland Angles, entering into partnership with the seafaring Saxons, first set foot on British soil under the style, already duly hyphenated, of "Anglo-Saxons." To be sure, in Britain itself the compound name was not heard till some ages later, and then only in a very special and narrow sense. But on the mainland it was known much earlier. Paul the Deacon uses it;² it may have been used earlier still. So there is really a very fair case made out for "Anglo-Saxon invaders of Britain" coming from Mid-Germany, and no doubt bringing the three-field system with them. We have only to suppose that in the matter of agriculture some such agreement was made between the different classes of settlers, as we know was sometimes made among joint settlers in early times. The Sicilian Naxos reckoned as a colony of Chalkis, but it took its name from the elder Naxos. In Himera, peopled by Dorians and Chalkidians, the speech was mingled, but the laws were Chalkidian. So in

the Anglo-Saxon colonization of Britain it was evidently agreed that the Angles should bring their system of three-field culture into the conquered land; the Saxons, Low-Saxons, Frisians, and Jutes, any other votaries of marling and peat-manure, had to conform to the practice of their betters.

There would still remain the question of language, — a point of which Mr. Seeböhm does not seem to have thought, but on which Zeuss underwent some searchings of heart. He puts the question, without very positively settling it, whether Angles who dwelled so far south spoke High Dutch or Low. In the fifth century, indeed, the question could hardly have been of the same moment as it would have been in the ninth. The High Dutch has not as yet wholly parted company with the Low. Still the point is worth thinking of. Those who use the one-field and the peat-manure have ever belonged to the ranks of men who *eaten* and *drinken*. It may be that those who practise the three-field culture had already begun to fall off to them who *essen* and *trinken*. But one thing at least is certain: no man ever did *essen* and *trinken* in this isle of Britain. If, then, the Angles of the inland England had begun to adopt the more modern forms, something of an agreement — again like that of the Dorians and the Chalkidians — must have been come to between them and their Nether-Dutch companions. While the inland Angles had their way in the matter of three-field culture, the lesser point of language was yielded in favor of the seafaring Saxon.

Mr. Seeböhm's casual theory, then, when worked out with some little care, really puts on so winning an air that it is hard not to accept it. Yet, even if we accept the existence of an inland *Angeln* without any doubt, Mr. Seeböhm's theory at least would no thold water. It simply has against it the universal belief of Englishmen from the beginning. In the eyes of Baeda, in the eyes of the Chroniclers, in the eyes of the gleeman of Brunanburh, in the eyes of all who ever spoke or sang of the great migration of our people, the Angles, no less than the Saxons, count among the seafaring folk of northern Germany. The England from whence they came, the England which their coming was said to have left empty of men, was the England of the coast of Sleswick, not any inland England between Westfalia and Thuringia. At all events, if we are to believe otherwise, we have at least a right to ask that the question shall be thoroughly discussed on its own merits, and not tossed jauntily aside as a small point in the history of the rotation of crops. Till then, whether we believe that we were called "*ab angelica facie, id est pulera*," or merely because we dwelled "*in angulo terræ*" we shall still go on believing that it was from the borderland of Germany and Denmark that our forefathers, set forth to work by sea their share in the wandering of the nations. It may be that some of the Anglian folk may well have strayed inland, as some of the Saxon folk may have strayed farther inland still. But the first England of history, the land from which men set forth to found the second, as from the second they set forth to found the third, was assuredly no inland region from which they had to make their way to a distant coast and there pick up Saxons or Frisians as companions of their further journey. The little England, the little "*angulus terræ*," of Sleswick was only part of it. There is no need minutely to measure how much was Anglian, how much Saxon, how much Frisian, how much belonged to any other branch of the common stock. In the days of Tacitus and Ptolemy the Angle and the Frisian were folk of the mainland only: by the days of Procopius they had won their home in the island to part of which one of them was to give his name.

We came by sea. By no other way indeed could we make our way into an island. But we came by sea in another sense from that in which Roman Cæsar came by sea before us and Norman William came after us. We came by sea not simply because the sea was the only road but because we came as folk of the sea to whom the sea was not a mere path but a true home. Of the details of the purely Anglian settlement and of the Angles themselves we know comparatively little, for the obvious reason that they lay farther off than their fellows from

¹ "Die Deutschen und die Nachbarstämme," 153, c.f. 495. It would be dangerous to enter casually and light-heartedly on questions about "Angrivarii," "Engern," and the like.

² Paul the Deacon speaks of "Angli-Saxones" (iv. 22, vi. 15) and "Saxones Angli" (v. 37). For other instances see Norman Conquest, i. 541.

the range of Roman knowledge. But of the Saxon shipmen and their doings we know a good deal: Sidonius has taken no small pains to show what manner of men they seemed to be in the eyes of the Roman of Gaul.¹ They first harried and then settled on both sides of the Channel. That their settlements in Britain were greater and more abiding than their settlements in Gaul was the result of many later causes. The Saxon of Chichester owes his presence on British ground to the same general effort to which the Saxon of Bayeux owed his presence on Gaulish ground. The Saxon of Chichester keeps his Saxon speech and from his land the Saxon name has not passed away. The Saxon of Bayeux has for ages spoken the Latin tongue of his neighbors, and while Sussex yet lives on the map, the *Otlingua Saxonica* has given way to other names to the *Bessin* and the department of *Calvados*. But each was planted in his new home by the force of the same movement, the Saxon wandering on the sea. And once planted in his new home, whether in the island or on the mainland, he ceased to be a wanderer by sea. He sat down and tilled the earth, and he guarded the earth which he tilled by the arms no longer of the seafarer but of the land warrior. The change is not wonderful. It has often happened in other lands, it has happened again in the same land. To be seafaring folk or to be landsmen is not always a question of what is born in the blood. Prosaic as it sounds, it is often the result of the circumstances in which men find themselves. Seafaring Corinth planted at one blow her twin colonies of Korkyra and Syracuse. Korkyra on her island met her parent on the seas with fleets equal to her own. Syracuse, planted in an island indeed, but an island that was in truth a continent, took to the ways of continents. Her landfolk were driven to take to the sea to meet the attacks of those Athenians who, two or three generations before, had been no less landfolk themselves.² So it was in the very land of Bayeux. When the Northmen came in their ships, neither Saxon nor Frank had ships to withstand them. Presently the seafaring Northmen, once settled in the land, changed into Norman landfolk, foremost of warriors with horse and lance, but to whom the horses of the wave had become simply means to carry them safe from Rhêgion to Messana, or from St. Valery to Pevensey.

Why, some one may ask, do I put forth again such very obvious truths as these? Because they are of no small importance, if we are to discuss the latest theory of all as to the origin of the English people. The only question is whether that theory need be discussed at all: it is hard to argue against that state of mind which, in the days when we learned logic, we used to call *ignoratio elenchi*. But if not discussed, it must be mentioned. Perhaps if this newest view of all had not come up the other day, I might not have chosen this time to talk about the views of Mr. Seebohm. But when M. Du Chaillu puts forth his theory, it at once recalls Mr. Seebohm's theory. The two stand in a certain relation to one another: neither can be fully taken in without the other. Both alike throw aside the recorded facts of history in the interest of a theory, be it a theory of the rotation of crops or a theory of the greatness of Vikings. Each theorist alike, possessed of a single thought, cannot be got to stop and think what there is to be said on the other side. M. Du Chaillu has put forth two very pretty volumes, with abundance of illustrations of Scandinavian objects. Most of them, to be sure, will be found in various Scandinavian books: still here they are, very many of them, and looking very pretty. M. Du Chaillu has given us a great many translations of sagas; but we have seen other translations of sagas, and some of them have been made by sound scholars. Criticism is hardly attempted. When the Scandinavian legend can be tested by the authentic English history, when the saga itself can be divided into the contemporary and trustworthy verse and the later and untrustworthy prose, — work, all this, which has been done over and over again by the scholar for more than one nation, — M. Du Chaillu simply gives us the sagas again, with comments now and then of amazing simplicity. The saga

of Harold Hardrada, the bits of genuine minstrelsy of the eleventh century patched together by the prose of the thirteenth, has been long ago thoroughly examined in its relations to the English narratives; above all, to the precious piece of contemporary English minstrelsy preserved by Henry of Huntingdon. It might have seemed hardly needful nowadays to prove once more that the picture of the English army in the saga is simply a fancy piece drawn from an English army of the thirteenth century. There are the English archers, the English horsemen, horsemen too whose horses are sheeted in armor. If any man doubts, he has nothing to do but to compare Snorro's fancy piece with the living representation of a real English army of the eleventh century in the contemporary tapestry of Bayeux. There he will see that to the English of that day the horse was simply a means to carry him to and from the place of battle, and that the clothing of horses in armor was a practice as yet unknown to the Norman horsemen themselves. Yet after all this, so often pointed out, M. Du Chaillu volunteers a little note to say that Snorro's version proves "that the English, like their kinsmen, had horses." That we had horses, no man save Procopius¹ ever doubted; but both Brihtnoth and Harold got down from their horses when the work of battle was to begin.

It is hardly by an adversary who cannot wield the weapons of criticism better than this that we shall be beaten out of the belief that there is such a thing as an English people in Britain. Perhaps, too, we shall not be the more inclined to give up our national being when we see its earliest records tossed aside with all the ignorant scorn of the eighteenth century. The "Frankish and English chroniclers" rank very low in the eyes of M. Du Chaillu. We know exactly where we have got when we come to the old conventional talk about "ignorant and bigoted men," "monkish scribes," and the like. Among these monkish scribes we have to reckon Einhard and Count Nithard, and our own literary ealdorman, Fabius Patricius Quæstor Ethelwardas. The odd thing is that, with M. Du Chaillu, Franks and Saxons or English go together. He is at least free from his countrymen's usual weakness of claiming the Franks, their kings, their acts, and their writings, for their own. As far as his theory can be made out, it seems to be this: the Suiones of Tacitus are the Swedes, and the Suiones had ships; so far no one need cavil. But we do not hear of the Suiones or any other Scandinavian people doing any thing by sea for several centuries. But, though we do not hear of it, they must have been doing something. What was it that they did? Now, in the fourth, fifth, sixth, centuries, we hear of the Saxons doing a good deal by sea: therefore the name "Saxones" must be a mistake of the Latin writers for "Suiones." It was not Saxons, but Swedes, or at least Scandinavians of some kind, who did all that is recorded of the Saxons, and presumably of the Angles and Jutes also, in Gaul, Britain, or anywhere else. The Angles and Saxons, therefore, who have been hitherto thought to have settled in Britain in the fifth and sixth centuries, are all a mistake. They were not Angles or Saxons at all, but Scandinavians of some kind. Hengest and Ælle were simply the advanced guard of Hubba, Sween, and Cnut. They could not have been Saxons, because, when the Northmen came against the continental Saxons of later times, they found no fleets to withstand them.

The assumption that goes through all this is, that once a seaman, ever a seaman; once a landsman, ever a landsman. These could not be seafaring Saxons in the fifth century, because we do not hear of Saxon fleets in the eighth. On the other hand, because the Suiones had ships in the days of Tacitus, as they could not have left off using ships, it must have been they who did the acts which are commonly attributed to the Saxons. A good deal is involved in this last assumption: it is at least conceivable, and not at all unlike the later history of Sweden, that the Suiones went on using their ships, but used them somewhere else, and not on the coast of Gaul or Britain. But of the grand assumption of all—the assumption that the landsman can never become a seaman or the seaman a

¹ The great description comes in the sixth letter of the seventh book.

² Thucydides, vii, 21.

¹ Bell. Gotth. iv. 20.

landsman—I have spoken already. And if this be a real difficulty, it is just as great a difficulty on M. Du Chaillu's theory as it is according to the genuine records of English history. Over and over again has it been noticed as a strange thing that the settlers who came to Britain by sea, as soon as they were settled in Britain, left off their seafaring ways, and had no fleet to withstand the Danes when the Danes did come. There is in this really nothing wonderful. But if this be a difficulty in the case of Anglian or Saxon settlers, it is hard to see how the difficulty becomes any less if the settlers are rated to be Swedish, Danish, or Norwegian.

In truth, M. Du Chaillu's theory is several degrees more amazing than that of Mr. Seebohm. How did we come by our language? How did we come by our national names? We did not, according to this theory, light by the way on any of those Low-Saxon, Frisian, or Jutish companions and teachers who, in Mr. Seebohm's view, may have done so much for us. And it is a little daring of M. Du Chaillu to represent the use of the Saxon name, as applied to the ravagers and settlers of Gaul and Britian, as simply the mistake of some Latin scribe, some ignorant blunderers like Claudian or Sidonius, who wrote "Saxones" when they should have written "Suiones." The mistake went a little deeper than that. How came the Teutonic settlers in Britain to call themselves Angles and Saxons? How did their Celtic neighbors come to call them Saxons? How did the conquered land come to take, here the Anglian, there the Saxon, name? One is astonished to read in M. Du Chaillu's book, "Nor is any part of England called *Saxland*." It is possible from the context that what is meant is merely that no part of England is so called in the northern sagas. But the name of "England" comes often enough in them, and "England" is as bad as "Saxland" for M. Du Chaillu's theory. It is hardly worth searching through all the sagas to see whether such a word as "Saxland" is ever found there or not. If it be so, it merely proves that no northern writers had any need to speak of Wessex, Essex, Sussex, or Middlesex by their local names. But considering that those names have been in unbroken use in the lands themselves ever since the fifth and sixth centuries, it does not much matter whether any sagaman called them so or not. It is more important, from M. Du Chaillu's point of view, to explain how West-Saxons, East-Saxons, South-Saxons, and Midde-Saxons were led into such strange mistakes as to their own name and origin.

No one denies that the Scandinavian infusion in England is real, great, and valuable; only it is an infusion which dates from the ninth century, and not from the fifth or sixth. Danish writers, without going quite so far as their champion from Valland, have often greatly exaggerated the amount of Scandinavian influence in England. They have often set down as signs of direct Scandinavian influence things which are simply part of the common heritage of the Teutonic race. But no one doubts that the Danish infusion in England was large, that in some parts it was dominant; and its influence was wholesome and strengthening. Dane and Angle, Dane and Saxon, were near enough to each other to learn from one another, and to profit by one another. They were near enough to be fused into one whole by a much easier process than that which in some parts of the island did in the end fuse together the Briton and the Teuton. Still the Scandinavian infusion was but an infusion into the already existing English mass. As we are not a British people, but an English people with a certain British infusion, so neither are we a Scandinavian people, but an English people with a certain Scandinavian infusion.

One word about the Franks, whose fate at M. Du Chaillu's hands is so oddly the same as that of the Saxons. According to him, as some Suiones were mistaken for Saxons, which gave rise to the error of looking on Saxons as a seafaring people, so also some Suiones were mistaken for Franks, which gave rise to the error of looking on Franks as a seafaring people. But this last error, at all events, never led astray any one. The Franks were not a seafaring people, nor [did any body ever

think that they were. The whole notion of seafaring Franks comes from two passages of Eumenios and Zôsimos which record a single exploit of certain Frankish prisoners, who seized on some ships in the Euxine and amazed mankind by sailing about the Mediterranean, doing much damage in Sicily, and getting back to Francia by way of the Ocean. This single voyage, wonderful as it was, is not quite the same thing as the habitual harrying of the coasts of the Channel, and of the Ocean too, by Saxons in their own ships. And when Ammianus speaks of Franks and Saxons laying waste the Roman territory by land and sea, the obvious meaning surely is that the Franks did it by land, and the Saxons by sea. But all things about Franks are surely outdone by a single sentence of M. Du Chaillu, standing alone with all the honors of a separate paragraph.

"In the Bayeux tapestry, the followers of William the Conqueror were called Franci and they have always been recognized as coming from the north."

Further comment is needless. We decline to be brought from the north by M. Du Chaillu, even more strongly than we decline to be brought from the south by Mr. Seebohm: for Mr. Seebohm does leave some scrap of 'separate national being to the "Anglo-Saxon invaders" from the English land of middle-Germany; M. Du Chaillu takes away our last shreds; we are mere impostors, Suiones falsely calling ourselves Saxones. But let us speculate what might happen if M. Du Chaillu's theory should ever fall into the hands of those statesmen and princes of the Church who seem to have lately taken in hand the nomenclature of that part of mankind whom plain men may think it enough to call the English folk.¹ The other day one eminent person enlarged of the glories of the "Anglo-Saxon race," while another enlarged instead on the glories of the "British race." A third claimed the right of free discussion for all "speakers of the British language." Let gallant little Wales look out: there would seem to be some corner in its twelve (or thirteen) counties in which free discussion is just now not allowed. New names often take. In my youth the "Anglo-Saxon race" was unheard of, and the "British race" dates, I believe, only from the speech of last week, from which I quote. Why should the Suiones, so long and so unfairly cheated of their honor, not have their day at last? Set forth with a good delivery, at the end of a fine rolling period, "the imperial instincts of the Suionic race" would be as likely to draw forth a cheer as other phrases whose amount of meaning is very much the same. When will men, statesmen above all, learn that names are facts; that words, as expressing things, are themselves things; that a confused nomenclature marks confusion of thought, failure to grasp the real nature of things and the points of likeness and unlikeness between one thing and another? Leaving, then, the Anglo-Saxon race and the British race and the Suionic race, and the instincts, imperial or otherwise, of any of them, this question of the origin of our people, this great and abiding dispute whether we are ourselves or somebody else, suggests one or two practical thoughts. Here I rule no point of present controversy; I only give some hints which may possibly help those who have to rule such points.

There is an English folk, and there is a British Crown. The English folk have homes: the British Crown has dominions. But the homes of the English folk and the dominions of the British Crown do not always mean the same thing. Here, by the border stream of the Angle and the Saxon, we are at once in one of the homes of the English folk and in one — and I dare to think the noblest and the greatest — of the dominions of the British Crown. If we pass to the banks of the Indus and Ganges, we are still within the dominions of the British Crown, but we cannot say that we are any longer among the homes of the English folk. Let us pass again to the banks of the Potomac and the Susquehanna: there we have gone out of

¹ See the speeches of the Earl of Rosebery, Cardinal Manning, and the Earl of Carnarvon in the Times of Nov. 16, 1889. The qualification needful in all such cases must of course be understood — "if the speakers really said what the reporters put into their mouths."

¹ "The Viking Age," vol. i. p. 20.

the dominions of the British Crown, but we have come back again to the English folk in one of their chiefest homes. These are but plain facts—plain as the sun at noonday. It is because they are so plain, that mankind, above all orators and statesmen, will not understand them. Once more, let a man's words set forth his thoughts, and let him shape his thoughts by the facts. That is all; but if this counsel of perfection be too hard, it may be better to declaim about the "Suionic race" than about the "Anglo-Saxon race." It will lead fewer people astray.

EDWARD A. FREEMAN.

ELECTRICAL NEWS.

EDINBURGH INTERNATIONAL ELECTRICAL EXHIBITION. — The executive council decided to finally close the list of applications for space on Jan. 15, when allotment was proceeded with. The French, Italian, and Austrian exhibits are expected to be specially fine, while India, China, and Japan will all be well represented in the department devoted to general industries. The railway machinery and appliances section promises well, several of the leading railway companies having agreed to exhibit; while among electrical exhibitors are Sir William Thomson, W. H. Preece, Edison, the general post-office, Edison-Swan, Laing, Wharton & Down, Anglo-American Brush, Paterson & Cooper, United Electrical Engineering, King, Brown & Co., Mavor & Coulson, Sir William Vavasour (Limited), Elmore Copper Depositing Company, Thomson-Houston Welding Company, Newell Engine Company, Robey & Co., Electric Traction Company, Ernest Scott & Co., Ronald Scott, Woodhouse & Rawson, Butler, Jobson & Co., W. T. Glover & Co., National Telephone Company, Consolidated Telephone Construction Company, Col. Gouraud, Gent & Co., Exchange Telegraph Company, Eastern Telegraph Company. The Decauville Company propose to show a narrow-gauge railway in operation, but worked by electricity in lieu of steam. The executive council have arranged with Immisch & Co. for a ten-minutes' service of electric launches on the Union Canal between Fountainbridge and the exhibition, which will afford the public a novel and interesting mode of conveyance, and will probably constitute the first example of electric navigation for general traffic. In addition to the British electrical contingent, about one hundred and fifty electrical exhibits are expected from France, where the government have officially recognized the exhibition, and considerable numbers from other foreign countries. The financial prospects of the exhibition are regarded by the finance committee as eminently satisfactory, as, owing to the much larger sums obtained for refreshment and other concessions above those received at the former Edinburgh Exhibition of 1886, it is considered that the whole cost of the buildings, grounds, and preparations will be defrayed without drawing on the admission receipts at all, whereas in 1886 no less than \$110,000 had to be made up out of admission receipts before any thing was available wherewith to meet working expenses.

FRANKFORT ELECTRO-TECHNICAL EXHIBITION. — It is proposed to hold at Frankfort-on-the-Main an international electro-technical exhibition from June 1 to Oct 31 of the present year. The exhibition will include all branches of the electrical science and industry, but as a rule only those exhibits will be admitted which show a decided improvement on those of the last special exhibitions at Munich in 1882 and Vienna in 1883. The exhibits will be divided into twelve great groups, commencing with motors for electro-technical purposes, and ending with electrical literature. Applications should be made before Jan. 15, and addressed to Mr. Leopold Sonnemann, editor of the *Frankfurter Zeitung*, Frankfort-on-the-Main.

MR. A. W. PEARSON, for many years city editor of the *Morning Bulletin*, Norwich, Conn., in addition to his regular work on the *Bulletin*, will edit the entomological department of *The Observer*, — a paper for all who love the out-door world. *The Observer* is published at Portland, Conn.

BOOK-REVIEWS.

Practical Marine Surveying. By HARRY PHELPS. New York, Wiley. 8°. \$2.50.

THE author of this work, who is an officer in the United States Navy, elucidates, in a simple and straightforward manner, all the points that usually arise in a marine survey, omitting no essential detail, and yet avoiding the confusion produced by a multiplicity of explanations such as are too often indulged in by writers who aim to be practical rather than theoretical. The instructions given in the book are practical in the true sense of the word; that is, they show the student how theories are utilized in actual practice.

This work was specially prepared for use at the Naval Academy at Annapolis, where the need of such a text-book had been felt for several years by officers engaged in teaching marine surveying. The author, having been engaged exclusively in surveying work for some six years previous to his assignment to duty at the Naval Academy, was requested by the head of the department of astronomy, navigation, and surveying, to prepare a text-book on the subject of marine surveying to take the place of the one then in use. This volume is the result, and it will without doubt prove valuable not only to students at the academy, but also to others pursuing the same line of study. The methods described and explained in the work have been used in actual practice, with few exceptions, and have been found to give satisfactory results.

The author acknowledges his indebtedness to Lieut-Commander Asa Walker, U. S. N., who specially prepared the chapter on projection; and to Wharton's "Hydrographic Surveying," whence he takes the method of platting angles by means of chords. The book contains numerous illustrations and diagrams, including two excellent photo-engravings of the sounding-machine on the United States steamer "Ranger," in the chapter on sounding with wire.

Practical Hints for the Teachers of Public Schools. By GEORGE HOWLAND. (International Education Series.) New York, Appleton. 16°.

THE several chapters of this work were originally a series of lectures delivered by the author as superintendent of schools in Chicago. They are, as their name indicates, of a purely practical character, with only incidental references to educational theories, and they have been prepared with the special object of assisting teachers in their every-day work. The chief fault of the book is its desultory character, there being little attempt at an orderly development of the thought; but it is animated by an excellent spirit, and conveys many hints and suggestions that can hardly fail to be useful to bright and progressive teachers. Mr. Howland, we are glad to note, is not so excessively fond of mere method and professional training as some enthusiasts are, but insists more on the character of the teacher and the spirit with which she pursues her work. He remarks that "methods are not for their own sake—they are but means to an end;" and, again, that "the purpose of the public school, as seen in its origin and history, is intellectual culture, and those methods only can have a strong and lasting hold on the public mind which best promote this." He has some interesting remarks on school government and discipline, as to which he leans toward leniency rather than severity. He discusses the question of moral instruction in the public schools, which has been so much talked of lately, and shows very clearly that the schools exert a powerful influence on the character and conduct of the pupils, apart from any specific moral instruction. Indeed he speaks slightly of such instruction, when given in a formal manner, and maintains that morals are best taught by the example of the teacher, the requirements of the lessons, and the social life of the school. Besides these more general topics, Mr. Howland touches on a multitude of points in teaching and school management, showing a thorough knowledge of his subject and a lively interest in it. His book is one that teachers especially will like to read.

Publications received at Editor's Office,
Jan. 13-25.

- ÆSCHINES** against Ctesiphon (on the Crown). Ed. by R. B. Richardson. Boston and London, Ginn. 279 p. 12°. \$1.50.
- BOARD of Trade Journal.** Vol. I. No. 1. m. Providence, R. I. 36 p. f°. \$2 per year. Little & Borth.
- CAMPBELL, W. M.** Foot-Prints of Christ. New York, Funk & Wagnalls. 375 p. 8°.
- COOKE, M. W.** The Human Mystery in Hamlet: An Attempt to Say an Unsaid Word. New York, Fords, Howard & Hulbert. 135 p. 12°. \$1.
- DAVIS, E. H.** The Second Reading-Book. Philadelphia, Lippincott. 208 p. 12°. 40 cents.
- EVOLUTION.** Popular Lectures and Discussions before the Brooklyn Ethical Association. Boston, J. H. West. 400 p. 12°. \$2.
- GILMORE, J. R., and ABBOTT, L.** The Gospel Commentary. New York, Fords, Howard, & Hulbert. 840 p. 16°. \$1.50.
- HOPTON, W.** Conversation on Mines, etc., between a Father and Son. Philadelphia, Lippincott. 326 p. 12°. \$1.25.
- HORNADAY, W. T.** The Extermination of the American Bison. Washington, Government. 180 p. 8°.
- HOWLAND, G.** Practical Hints for the Teachers of Public Schools. New York, Appleton. 198 p. 16°.
- KANSAS.** List by Counties of Newspapers and Periodicals published in, Jan. 1, 1889. Compiled by F. G. Adams. Topeka, State. 38 p. 8°.
- MASON, W. P.** Notes on Qualitative Analysis. 2d ed. Troy, N. Y., Nims & Knight. 44 p. 8°.
- MERRIMAN, M., and JACOBY, H. S.** A Text-Book on Roofs and Bridges. Part II. Statics. New York, Wiley. 124 p. 8°. \$2.50.
- MOOREHEAD, W. K.** Fort Ancient. Cincinnati, Robert Clarke & Co. 129 p. 8°. \$2.
- OSTROM, K. W.** Massage and the Original Swedish Movements; their Application to Various Diseases of the Body. Philadelphia, Blakiston. 97 p. 12°. 75 cents.
- PENNSYLVANIA** Geological Survey. Atlas Eastern Middle Anthracite Field. Part I. Harrisburg, State. 8°.
- Atlas Northern Anthracite Field. Part V. Harrisburg, State. 8°.
- Atlas Southern Anthracite Field. Part II. Harrisburg, State. 8°.
- PHARAOH.** An Appeal to: The Negro Problem, and its Radical Solution. New York, Fords, Howard, & Hulbert. 205 p. 12°. \$1.
- RIBOT, T.** The Psychology of Attention. Authorized translation. Chicago Open Court Publ. Co. 121 p. 12°. 75 cents.

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- IRVING.** Physical and Chemical Studies in Rockmetamorphism, based on the thesis written for the D.Sc. Degree in the University of London, 1888. By the Rev. A. Irving, D.Sc. London, Senior Science Master at Wellington College. 8vo, \$1.75.
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AMONG THE PUBLISHERS.

IN the February *Atlantic* the Bering Sea question is discussed by Charles B. Elliott; and Mr. K. Kaneko, the head of the Japanese commission which has been visiting various countries to compare their legislative assemblies, in order to establish a Japanese parliament, has a paper on "An Outline of the Japanese Constitution." The article which will arouse the most discussion is by Gen. Francis Walker, about Mr. Bellamy and the new Nationalist party. There are four articles devoted to recent books on political and historical subjects.

— Messrs. J. B. Lippincott Company publish immediately the long-looked for book concerning Henry M. Stanley and his rescue of Emin Pasha. This work, entitled "Stanley's Emin Pasha Expedition," will be entirely authentic in every particular, as it is compiled from Stanley's own letters to the president of the society which was mainly instrumental in sending him on the journey. The book contains about four hundred pages, together with numerous illustrations and maps.

— *Public Opinion* has issued No. 3 group of "Representative Moulders of Public Opinion." The first two contain portraits of the editors of daily papers. The third is confined to the weeklies and monthlies, of which the following is a list: E. L. Godkin of the *Nation*; H. Clay Trumbull of the Philadelphia *Sunday School Times*; A. E. Winship of the Boston *Journal of Education*; Prof. W. J. Youmans of the *Popular Science Monthly*; Henry C. Bowen of the *Independent*; Mrs. Martha J. Lamb of the *Magazine of American History*; Rev. Edward Bright of *The Examiner*, New York; J. N. Hallock, *Christian at Work*, New York; Rev. A. E. Dunning, *The Congregationalist*, Boston; Rev. C. W. Leffingwell, *The Living Church*, Chicago; F. M. Somers, *Current Literature*, New York; Rev. Samuel J. Barrows, *The Christian Register*, Boston; F. M. Hexamer, *American Agriculturist*, New York; George William Curtis, *Harper's Weekly*; Rev. Charles Parkhurst, *Zion's Herald*, Boston; Rev. Lyman Abbott, *Christian Union*, New York; William H. Hills, *The Writer*, Boston; Joseph Keppler, *Puck*; Rev. John Talbot Smith, *The Catholic Review*, New York; Rev. O. P. Fitzgerald, *Christian Advocate*, Nashville, Tenn.; R. H. Edmonds, *Manufacturer's Record*, Baltimore; David M. Stone, *Journal of Commerce*, New York; Albert C. Stevens, *Bradstreets*, New York; Rev. Simeon Gilbert, *The Advance*, Chicago; Richard H. Clarke, *Catholic Quarterly*, New York; T. C. Martin, *The Electrical World*, New York; Joseph B. Gilder, *The Critic*; Rev. J. W. Mendenhall, *Methodist Review*, New York; W. J. Arkell, *Judge*, New York; L. S. Metcalf, *The Forum*; R. W. Gilder, *The Century Magazine*; E. L. Burlingame, *Scribner's Magazine*; Lloyd Bryce, *North American Review*; Allan Forman, *The Journalist*, New York; John A. Mitchell, *Life*, New York; E. H. Talbot, *The Railway Age*, Chicago; William H. Park, *Banker's Monthly*, Chicago; Howard M. Jenkins, *The American*, Philadelphia; John Boyle O'Reilly, *The Pilot*, Boston; Rev. A. T. Pierson, *Missionary Review of the World*, Philadelphia; DeWitt J. Seligman, *The Epoch*, New York; Rev. Wendell Prime, *The Observer*, New York; N. D. C. Hodges, *Science*, New York; Charles W. Price, *Electrical Review*, New York; Rev. I. K. Funk, *Voice*, New York; and Rev. David H. Moore, *Western Christian Advocate*, Cincinnati.

LETTERS TO THE EDITOR.

An Insect Destructive to Wheat.

ON p. 41, No 363, of *Science*, you tell that "an insect destructive to wheat, but previously unknown in this country, has appeared in considerable numbers in the Cornell University farm at Ithaca." We beg to say that so long as thirty-five to forty years ago, and probably longer, an insect similar in appearance and behavior to the foregoing was common in the wheat-fields of middle Tennessee, though we never knew them to be sufficiently numerous to seriously reduce the yield of grain. That it was the same insect, we have no doubt.

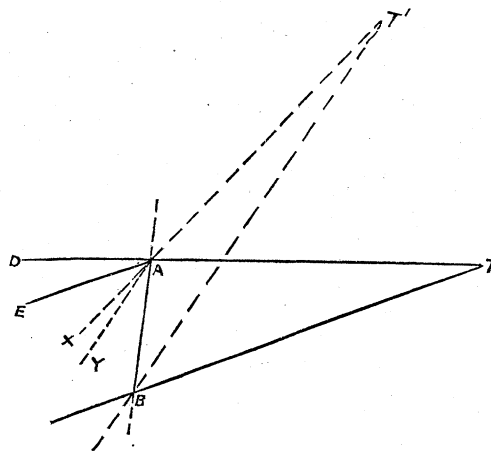
Q. C. SMITH.

Austin, Tex., Jan. 22.

The Fiske Range-Finder.

IN *Science* of Jan. 24 there is a full and comprehensive description of the Fiske range-finder, which, although interesting and very ingenious in regard to its electrical arrangement, is not so clear in its mathematical principles. I refer particularly to Fig. 4, p. 59. The error being so apparent, it cannot be conceived that the inventor has overlooked it, and I write more in a spirit of inquiry than of criticism.

Let the continuous lines in the following figure represent the essential conditions of Fig. 4, p. 59. Moving the index along the scale mn , op (Fig. 6, p. 59), a distance corresponding to the angle DAE, the bridge becomes balanced, and the reading will give the distance AT. Now let us suppose that from the position T, the object moves to T', AT' being equal to AT. The resulting diagram is indicated in broken lines. Moving the sliding index along the scale mn , op , as before, a distance corresponding to the angle XAY, the bridge is balanced, and the reading of the



scale will indicate the distance AT'; but this reading will by no means be the same as that obtained when the object was at T, because the angle XAY is smaller than DAE. In other words, it is impossible to construct a scale giving true distances of objects from A in terms of the angle DAE, unless we impose as a condition that one of the sight lines shall make a fixed and constant angle with the base.

The angle DAE will vary for different positions of the point T, in a circumference drawn with A as a centre and AT as a radius, having its maximum value when the triangle ATB is isosceles, and becoming 0 when T is in a rectilinear prolongation of the base.

THOS. L. CASEY.

New York, Jan. 27.

INDUSTRIAL NOTES.

The Anglo-American Storage-Battery.

A FORM of storage-battery invented by Mr. Charles Sorley, and manufactured by the Anglo-American Storage Battery Company of this city, is shown in Figs. 1 and 2. In the construction of the cell, the object aimed at by the inventor is to get as large an amount of active material as possible, with a correspondingly large conducting and contact surface. With a view to attaining this object, the plates of the cell are constructed as shown in Fig. 1, being built up of strips of lead bent into convolutions, as shown, and secured together so as to form a plate. The thickness of the plate, of course, depends upon the width of the strips. All the plates of the same sign are connected by means of the projecting ends of the lead strips, as shown in Fig. 1. The plates are separated and supported by insulating strips, and bound together by insulating rods, which pass through the centre of the plates. The complete cell is shown in Fig. 2.

A battery of these storage-cells has been in constant use in the Schermerhorn building in this city since May 20, 1889. Of this battery the superintendent of the building reports as follows: "In every respect it has exceeded the claims made for it, and is

saving us two and a half hours' running of engine and dynamo each day, half a ton of coal each week, and our gas bill is reduced proportionate to the number of lights we are wired for. We have never had the slightest trouble with it, and we have

only when running; now the dynamo runs only seven and a half hours each day, furnishing light the whole twenty-four hours where required.

Among the claims made for these cells are their high efficiency, yielding ninety to ninety-two per cent of the current put into them; their freedom from buckling or breaking, owing to

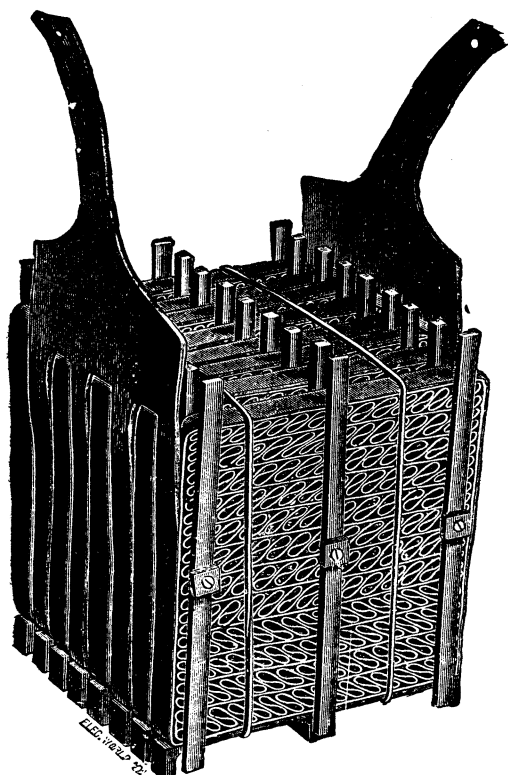


FIG. 1.

taken from it its rated capacity every night for the past thirty-three nights, and on Sundays from thirty-three and a third to fifty per cent in excess." Formerly, before the battery was put in, the dynamo ran ten hours daily, furnishing light, of course,

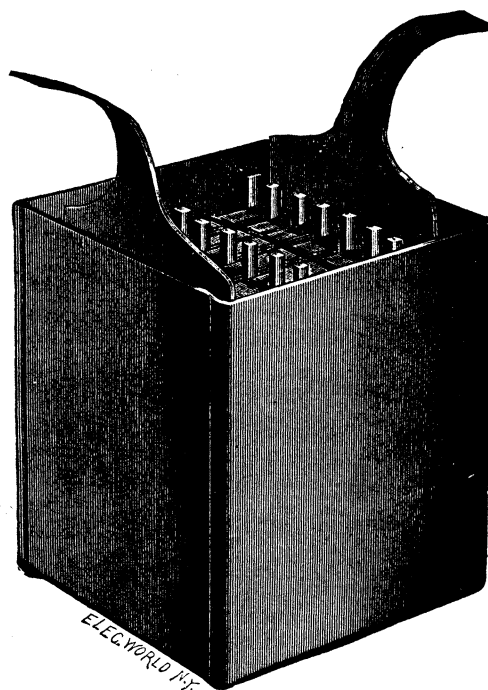


FIG. 2.

their peculiar construction; economy in use, as they can be charged in a comparatively short time; their capacity, giving about five hours and a half ampère hours per pound weight; simplicity of service, not requiring an expert electrician to superintend them; and, lastly, their long life. These batteries are now in use in many parts of the country.

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CALENDAR OF SOCIETIES.

Natural Science Association of Staten Island.

Jan. 9.—The building fund committee reported that the public appeal, heretofore adopted, had been printed and distributed to all members, to the press of the county, and to about two hundred prominent citizens in all parts of the island. Mr. Thos. Craig showed specimens of Staten Island pond-life under the microscope. Among the objects shown were *Amoeba proteus* and *Protococcus viridis*. The latter organism is the cause of the green coating on the trees, stones and fences, which has attracted so much attention lately, especially in New York, where some persons have tried to connect it with the prevailing epidemic of influenza or "grip." Dr. J. Britton showed seeds of native orchids (*Corallorhiza odontorhiza* and *C. multiflora*) under the microscope, and explained their differences of appearance and structure. Mr. Arthur Hollick presented specimens of *Draba verna* in full bloom, collected at Tottenville, Dec. 30, at which date the fields in places where white with it. Skunk cabbages were in full bloom in abundance in many of the swamps at the same place. Mr. Hollick also showed fossil leaves in clay ironstone from the shore at Tottenville. The specimens were part of a recent rich find, resulting in adding many new species of the local fossil flora, which will be studied and reported upon at some time in the future.

Exchanges

[Free of charge to all, if of satisfactory character. Address N. D. C. Hodges, 47 Lafayette Place, New York.]

Wanted.—Marine univalves of the west coast, from U. S. line southward, and from Pacific Islands, offered; exchange from a general collection. — F. C. Browne, Framingham, Mass., Box 50.

D. E. Willard, Curator of the Museum, Albion Academy, Albion, Wis., will answer all his correspondence as soon as possible. Sickness and death in the family, with many other matters, have prevented his answering as promptly as he should have done.

I will give 100 good arrow heads for a fine pair of wild cattle horns at least two feet long. If you have shorter or other horns write me, and also how many arrow heads you want for them. I will also exchange shells, minerals and arrows. W. F. Lerch, 308 East 4th St., Davenport, Iowa.

I wish to purchase Vol. 7 of the *American Chemical Journal*, either bound or unbound. State price. Address, Wm. L. Dudley, Vanderbilt University, Nashville, Tenn.

A few duplicates of *Murex radix*, *M. ramosus*, *M. brandaris*, *Cassis rufa*, *Harpa ventricosa*, *Olivula triangularis*, *Chlorostoma funebre*, *Cypraea caput serpentis*, *C. lynx*, *Lottia gigantea*, *Acmola patina*, *Chama spinosa*, and some thirty other species, for exchange for shells not in our collection. List on application. — Curator Museum, Polytechnic Society, Louisville, Ky.

Photographs and Stereoscopic views of Aborigines of any country, and fine landscapes etc., wanted in exchange for minerals and fossils. — L. L. Lewis, Copenhagen, New York.

Droysen's *Allgemeiner Historischer Hand-atlas* (Leipzig, 1886.) for scientific books — those published in the *International Scientific Series* preferred. — James H. Stoller, Schenectady, N. Y.

Astronomical works and reports wanted in exchange or to buy. Reports of observations on the planet Neptune and its satellite specially desired. — Edmund J. Sheridan, H. A., 205 Adelphi St., Brooklyn, N. Y.

I would like to correspond with any person having Tryon's "Structural and Systematic Conchology" to dispose of. I wish also to obtain State or U. S. Reports on Geology, Conchology, and Archaeology. I will exchange classified specimens or pay cash. Also wanted a copy of MacFarlane's "Geologists' Traveling Hand-Book and Geological Railway Guide." — D. E. Willard, Curator of Museum, Albion Academy, Albion, Wis.

Morris's "British Butterflies," Morris's "Nests and Eggs of British Birds," Bree's "Birds of Europe" (all

colored plates), and other natural history, in exchange for Shakesperiana; either books, pamphlets, engravings, or cuttings. — J. D. Barnett, Box 735, Stratford, Canada.

I have *Anodonta opalina* (Weatherby), and many other species of shells from the noted Koshkonong Lake and vicinity, also from Western New York, and fossils from the Marcellus shale of New York, which I would be glad to exchange for specimens of scientific value of any kind. I would also like to correspond with persons interested in the collection, sale, or exchange of Indian relics. — D. E. Willard, Albion Academy, Albion, Wis.

Will exchange "Princeton Review" for 1883, Hugh Miller's works on geology and other scientific works, for back numbers of "The Auk," "American Naturalist," or other scientific periodicals or books. Write. — J. M. Keck, Chardon, Ohio.

Shells and curiosities for marine shells, curiosities or minerals address W. F. Lerch, No. 308 East Fourth St., Davenport, Iowa.

I want to correspond and exchange with a collector of beetles in Texas or Florida. — Wm. D. Richardson, P. O. Box 223, Fredericksburg, Virginia.

A collection of fifty unclassified shells for the best offer in bird skins; also skins of California birds for those of birds of other localities. Address Th. E. Slevin, 2413 Sacramento St., San Francisco, Cal.

I have forty varieties of birds' eggs, side blown, first class, in sets, with full data, which I will exchange for books, scientific journals, shells, and curios. Write me, stating what you have to offer. — Dr. W. S. Strode, Bernadotte, Fulton County, Ill.

CATARRH.

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Sufferers are not generally aware that these diseases are contagious, or that they are due to the presence of living parasites in the lining membrane of the nose and eustachian tubes. Microscopic research, however, has proved this to be a fact, and the result of this discovery is that a simple remedy has been formulated whereby catarrh, catarrhal deafness and hay fever are permanently cured in from one to three simple applications made at home by the patient once in two weeks.

N.B.—This treatment is not a snuff or an ointment; both have been discarded by reputable physicians as injurious. A pamphlet explaining this new treatment is sent free on receipt of stamp to pay postage, by A. H. Dixon & Son, 337 and 339 West King Street, Toronto, Canada.—*Christian Advocate*.

Sufferers from Catarrhal troubles should carefully read the above.

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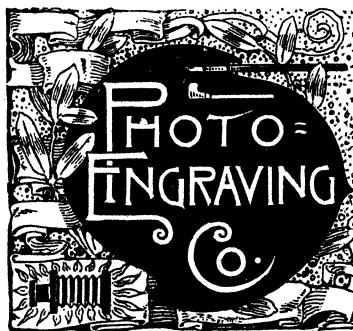
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